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(54) **GOLF CLUB HEAD/SHAFT CONNECTION ASSEMBLY, GOLF CLUB, METHOD OF PRODUCING A GOLF CLUB HEAD/SHAFT CONNECTION ASSEMBLY AND METHOD OF ASSEMBLING A GOLF CLUB**

VERBINDUNGSANORDNUNG FÜR GOLFSCHLÄGERKOPF UND SCHAFT, GOLFSCHLÄGER, VERFAHREN ZUR HERSTELLUNG EINER VERBINDUNGSANORDNUNG FÜR GOLFSCHLÄGERKOPF UND SCHAFT, UND VERFAHREN ZUR MONTAGE EINES GOLFSCHLÄGERS

ENSEMBLE DE RACCORDEMENT POUR TÊTE ET MANCHE DE CLUB DE GOLF, CLUB DE GOLF, PROCÉDÉ DE FABRICATION D'UN ENSEMBLE DE RACCORDEMENT POUR TÊTE ET MANCHE DE CLUB DE GOLF, ET PROCÉDÉ D'ASSEMBLAGE D'UN CLUB DE GOLF

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**EP 2 185 252 B1**

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**Description****FIELD OF THE INVENTION**

**[0001]** This invention relates generally to golf clubs and golf club heads. More particularly, aspects of this invention relate to golf clubs having releasable connections between the golf club head and the shaft and/or head/shaft position adjusting features to allow easy interchange of shafts and heads and/or to allow easy modification of the head/shaft positioning properties.

**BACKGROUND**

**[0002]** Golf is enjoyed by a wide variety of players - players of different genders and dramatically different ages and/or skill levels. Golf is somewhat unique in the sporting world in that such diverse collections of players can play together in golf events, even in direct competition with one another (e.g., using handicapped scoring, different tee boxes, in team formats, etc.), and still enjoy the golf outing or competition. These factors, together with the increased availability of golf programming on television (e.g., golf tournaments, golf news, golf history, and/or other golf programming) and the rise of well known golf superstars, at least in part, have increased golf's popularity in recent years, both in the United States and across the world.

**[0003]** Golfers at all skill levels seek to improve their performance, lower their golf scores, and reach that next performance "level." Manufacturers of all types of golf equipment have responded to these demands, and in recent years, the industry has witnessed dramatic changes and improvements in golf equipment. For example, a wide range of different golf ball models now are available, with balls designed to complement specific swing speeds and/or other player characteristics or preferences, e.g., with some balls designed to fly farther and/or straighter; some designed to provide higher or flatter trajectories; some designed to provide more spin, control, and/or feel (particularly around the greens); some designed for faster or slower swing speeds; etc. A host of swing and/or teaching aids also are available on the market that promise to help lower one's golf scores.

**[0004]** Being the sole instrument that sets a golf ball in motion during play, golf clubs also have been the subject of much technological research and advancement in recent years. For example, the market has seen dramatic changes and improvements in putter designs, golf club head designs, shafts, and grips in recent years. Additionally, other technological advancements have been made in an effort to better match the various elements and/or characteristics of the golf club and characteristics of a golf ball to a particular user's swing features or characteristics (e.g., club fitting technology, ball launch angle measurement technology, ball spin rates, etc.).

**[0005]** Given the recent advances, there is a vast array of golf club component parts available to the golfer. For

example, club heads are produced by a wide variety of manufacturers in a variety of different models. Moreover, the individual club head models may include multiple variations, such as variations in the loft angle, lie angle, offset features, weighting characteristics (e.g., draw biased club heads, fade biased club heads, neutrally weighted club heads, etc.). Additionally, the club heads may be combined with a variety of different shafts, e.g., from different manufacturers; having different stiffnesses, flex points, kick points, or other flexion characteristics, etc.; made from different materials; etc. Between the available variations in shafts and club heads, there are literally hundreds of different club head/shaft combinations available to the golfer.

**[0006]** Club fitters and golf professionals can assist in fitting golfers with a golf club head/shaft combination that suits their swing characteristics and needs. Conventionally, however, golf club heads are permanently mounted to shafts using cements or adhesives. Therefore, to enable a golfer to test a variety of head/shaft combinations, the club fitter or professional must carry a wide selection of permanently mounted golf club head/shaft combinations (which takes up a considerable amount of storage space and inventory costs) or the club fitter or professional must build new clubs for the customer as the fitting process continues (which takes a substantial amount of time and inventory costs). The disadvantages associated with these conventional options serve to limit the choices available to the golfer during a fitting session and/or significantly increase the expense and length of such a session.

**[0007]** Documents WO 90/00424 A and JP 2006 042951 A each disclose a releasable golf club head/shaft connection assembly and a method of assembling a golf club.

**SUMMARY**

**[0008]** The invention relates to a golf club head/shaft connection assembly as specified in claim 1, and to a golf club as specified in claim 6. The invention also relates to a method of producing a golf club head/shaft connection assembly, as specified in claim 13, and to a method of assembling a golf club, as specified in claim 14. Preferred embodiments are specified in the dependent claims.

**[0009]** The following presents a general summary of aspects of the invention in order to provide a basic understanding of the invention and various features of it. This summary is not intended to limit the scope of the invention in any way, but it simply provides a general overview and context for the more detailed description that follows.

**[0010]** Aspects of this invention relate to systems and methods for connecting golf club heads to shafts in a releasable manner so that the club heads and shafts can be readily interchanged and/or so that the angle and/or position of the shaft with respect to the club head body

(and its ball striking face) can be readily changed. Golf club head/shaft connection assemblies in accordance with examples of this invention may include: (a) a cylindrical structure having a first end and a second end opposite the first end, wherein the first end includes a first opening that defines a cylindrical interior chamber for receiving a golf club shaft, wherein an exterior surface of the cylindrical structure includes a rotation-inhibiting structure, and wherein the second end includes a securing structure; and (b) a securing system for releasably engaging the securing structure.

**[0011]** Further aspects of this invention relate to golf clubs in which the shaft is engaged with the golf club head using a shaft/club head connection member of the type described above. Such golf clubs may include: (a) a golf club head having a shaft-receiving chamber, wherein a first end of the shaft-receiving chamber includes a first rotation-inhibiting structure and a second end of shaft-receiving chamber includes a first opening for receiving a securing member; (b) a shaft connection member extending into the shaft-receiving chamber of the golf club head, the shaft connection member including a structure as generally described above; (c) a shaft engaged in the cylindrical interior chamber of the shaft connection member; (d) a securing member received through the second end of the shaft-receiving chamber of the golf club head and releasably engaging the securing structure of the shaft connection member to thereby releasably engage the shaft connection member with the golf club head; and/or (e) a grip member engaged with the free end of the shaft.

**[0012]** The club head and shaft may be interchanged with respect to one another by releasing the securing system and interchanging the originally present parts (e.g., shafts, club heads, etc.) with different parts, e.g., having different characteristics. Furthermore, the shaft may be angled. The chamber for receiving the shaft in the shaft connection member is angled or otherwise offset with respect to the axial direction of the shaft connection member so as to allow adjustment of the angle or position of the shaft with respect to the club head (e.g., with respect to its ball striking face).

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** A more complete understanding of the present invention and certain advantages thereof may be acquired by referring to the following detailed description in consideration with the accompanying drawings, in which:

Fig. 1 generally illustrates a front view of an example golf club according to this invention;

Figs. 2A through 2C illustrate various views of an example golf club head/shaft connection member that may be used in accordance with examples of this invention;

Figs. 3A through 3E illustrate example features of a connection between a golf club head and a shaft utilizing a golf club head/shaft connection member in accordance with an example of this invention; and

Figs. 4A through 6B illustrate various example features and structures that allow adjustment of various characteristics of a golf club, such as loft angle, lie angle, etc., utilizing golf club head/shaft connection members in accordance with examples of this invention.

**[0014]** The reader is advised that the attached drawings are not necessarily drawn to scale.

### DETAILED DESCRIPTION

**[0015]** In the following description of various example structures in accordance with the invention, reference is made to the accompanying drawings, which form a part hereof, and in which are shown by way of illustration various example connection assemblies, golf club heads, and golf club structures in accordance with the invention. Additionally, it is to be understood that other specific arrangements of parts and structures may be utilized, and structural and functional modifications may be made without departing from the scope of the present invention. Also, while the terms "top," "bottom," "front," "back," "rear," "side," "underside," "overhead," and the like may be used in this specification to describe various example features and elements of the invention, these terms are used herein as a matter of convenience, e.g., based on the example orientations shown in the figures and/or the orientations in typical use. Nothing in this specification should be construed as requiring a specific three dimensional or spatial orientation of structures in order to fall within the scope of this invention.

#### A. General Description of Golf Club Head/Shaft Connection Assemblies and Golf Clubs Including Such Assemblies According to Examples of the Invention

**[0016]** In general, as described above, aspects of this invention relate to systems and methods for connecting golf club heads to shafts in a releasable manner so that the club heads and shafts can be readily interchanged and/or repositioned with respect to one another. More detailed descriptions of aspects of this invention follow.

#### 1. Example Golf Club Head/Shaft Connection Assemblies and Golf Club Structures According to the Invention

**[0017]** One aspect of this invention relates to golf club head/shaft connection assemblies for securely, but releasably, connecting a golf club head and shaft. Such assemblies may include, for example: (a) a cylindrical structure having a first end and an opposite second end,

wherein the first end includes a first opening providing access to a cylindrical interior chamber for receiving a golf club shaft, wherein an exterior surface of the cylindrical structure (e.g., nearer to the first end than the second end) includes a rotation-inhibiting structure, and wherein the second end includes a securing structure; and (b) a securing system for releasably engaging the securing structure. While a variety of different securing structures and securing systems may be used without departing from this invention, in some example structures according to this invention, the securing structure will include a threaded hole defined in the second end of the cylindrical structure, and the securing system will include a threaded bolt element that engages the threaded hole. The cylindrical interior chamber and the threaded hole may be coaxial or non-coaxial, and optionally, they may be provided in the cylindrical structure completely independent from one another.

**[0018]** A variety of rotation-inhibiting structures and systems may be used without departing from this invention. In some example structures according to this invention, the rotation-inhibiting structure may include plural flat sides that extend in an axial direction of the cylindrical structure (optionally to form a polygon cross section having from 3-25 sides). In some more specific examples, the polygon cross section of the cylindrical structure that forms the rotation-inhibiting structure will have at least 4 flat sides (or even at least six or eight flat sides). Other non-round cross sectional configurations may be provided as part of the rotation-inhibiting structure without departing from this invention (e.g., star or asterisk shaped exterior surfaces, oval or elliptical shaped exterior surfaces, non-regular or non-symmetrically shaped exterior surfaces, etc.).

**[0019]** The rotation-inhibiting structure may extend along any desired portion of an overall longitudinal (or axial) length of the cylindrical structure without departing from this invention. In some more specific examples, the rotation-inhibiting structure will extend less than 50% of an overall axial length of the cylindrical structure, or even less than 35% of the overall axial length. On the other hand, the rotation-inhibiting structure, when present on the exterior surface of the cylindrical structure, will extend a sufficient portion of the overall longitudinal or axial length of the cylindrical structure so as to provide a solid, non-rotational engagement and feel (e.g., at least 2% of the overall axial length). In some more specific examples, the rotation-inhibiting structure will extend from 2-65% of the overall axial length of the cylindrical structure, or even from 5-50% or even 10-35% of the overall axial length.

**[0020]** The exterior surface of the cylindrical structure and its cylindrical interior chamber may be coaxial. On the other hand, these cylindrical structures need not be coaxial (e.g., they may extend in different directions, they may extend in parallel but in a non-coaxial direction, etc.). By providing non-coaxial cylindrical interior and exterior surfaces (or through other features of the club head, shaft, etc.), various properties, positions, angles, and the

like of the shaft with respect to the club head ball striking face may be changed, as will be explained in more detail below. If desired, the exterior surface of the cylindrical structure (e.g., at the first end thereof) may include a rotational position indicator to allow a user to easily see the position of the shaft/club head connection member with respect to the club head when in use.

**[0021]** Aspects of this invention further relate to golf clubs in which the shaft is engaged with the golf club head using shaft/club head connection members of the types described above. Such golf clubs may include: (a) a golf club head having a shaft-receiving chamber, wherein a first end of the shaft-receiving chamber includes a first rotation-inhibiting structure and a second end of the shaft-receiving chamber includes a first opening for receiving a securing member; (b) a shaft connection member extending into the shaft-receiving chamber of the golf club head, the shaft connection member including a cylindrical structure having a first end and an opposite second end, wherein the first end of the shaft connection member includes a second opening that defines a cylindrical interior chamber for receiving a golf club shaft, wherein an exterior surface of the cylindrical structure includes a second rotation-inhibiting structure that engages the first rotation-inhibiting structure, and wherein the second end includes a securing structure; (c) a shaft engaged in the cylindrical interior chamber of the shaft connection member; (d) a securing member extending into the second end of the shaft-receiving chamber of the golf club head and releasably engaging the securing structure of the shaft connection member to thereby releasably engage the shaft connection member with the golf club head; and/or (e) a grip member engaged with the free end of the shaft. The securing member may be inserted into the shaft-receiving chamber of the club head through an opening provided in the sole of the club head.

**[0022]** The rotation-inhibiting structure of the club head may constitute an opening having side walls or edges of the same non-round construction (e.g., polygonal, flat-sided, non-regular, etc.) as the rotation-inhibiting structure of the shaft/club head connection member as described above. Alternatively, if desired, the club head's opening or side walls may be differently shaped from the rotation-inhibiting structure of the connection member, but it may include appropriately located retaining walls, edges, or other structures so as to securely hold the connection member in a non-rotational manner.

## 2. Example Methods of Producing Golf Club Head/Shaft Connection Assemblies and Golf Clubs Including Such Assemblies According to the Invention

**[0023]** Another aspect of this invention relates to methods of producing club head/shaft connection assemblies in accordance with examples of this invention (e.g., of the types described above). Such methods may include,

for example: (a) producing a shaft connection member as a cylindrical structure having a first end and an opposite second end (e.g., via casting or molding processes, via extrusion, etc.); (b) producing an open cylindrical interior chamber for receiving a golf club shaft at the first end of the shaft connection member (e.g., via drilling or machining processes, etc.); (c) forming a rotation-inhibiting structure as part of an exterior surface of the cylindrical structure, e.g., nearer to the first end than the second end (e.g., by grinding, machining, etc.); (d) forming a securing structure at the second end of the shaft connection member (e.g., by drilling, tapping, or machining processes, etc.); and (e) providing a securing member for engaging the securing structure (e.g., by manufacturing it, from third party suppliers, etc.). If desired, the securing structure may be formed as a threaded hole defined in the second end of the cylindrical structure and the securing member may be provided as a threaded bolt element that is engageable with the threaded hole. The assembly may be formed so as to include any of the various structures and/or configurations described above (and described in more detail below).

**[0024]** Another aspect of this invention relates to methods of assembling golf clubs using club head/shaft connection assemblies in accordance with examples of this invention. Such methods may include: (a) providing a golf club head having a shaft-receiving chamber (e.g., by manufacturing it, from a third party supplier, etc.), wherein a first end of the shaft-receiving chamber includes a first rotation-inhibiting structure and a second end of shaft-receiving chamber includes a first opening for receiving a securing member; (b) engaging a shaft with a shaft connection member, wherein the shaft connection member includes a cylindrical structure, e.g., of the types described above; (c) placing at least a portion of the shaft connection member into the shaft-receiving chamber of the golf club head such that the first rotation-inhibiting structure engages a rotation-inhibiting structure provided with the shaft connection member to thereby inhibit rotation of the shaft connection member with respect to the golf club head; (d) placing a securing member into the second end of the shaft-receiving chamber; and (e) releasably engaging the securing member with a securing structure provided with the shaft connection member to thereby releasably engage the shaft connection member with the golf club head.

**[0025]** If desired, various characteristics or features of the club head may be changed, e.g., by changing a position of the shaft with respect to the club head (e.g., by rotating the shaft and its connection member with respect to the club head when the shaft is bent or when the cylindrical interior shaft receiving chamber of the connection member is non-coaxial with respect to its exterior cylindrical surface) to thereby change the loft, lie, offset, inset, or other features of the club head. Such methods may include: (a) releasing or disengaging the shaft connection member with respect to the golf club head; (b) changing a position of the shaft connection member with

respect to the golf club head (e.g., by rotating them with respect to one another) to thereby alter a position of a free end of the shaft with respect to a ball striking face of the club head; and (c) releasably engaging the securing member with the securing structure of the shaft connection member to thereby releasably engage the shaft connection member with respect to the golf club head at the changed position.

**[0026]** Additionally, or alternatively, aspects of the invention allow easy interchange of one shaft for another on the club head (or one club head for another on the shaft). Such methods may include: (a) releasing or disengaging the shaft connection member with respect to the golf club head; (b) engaging a second shaft with a second shaft connection member, wherein the second shaft connection member may include the various structures described above; (c) placing at least a portion of the second shaft connection member into the shaft-receiving chamber of the golf club head such that the first rotation-inhibiting structure of the shaft-receiving chamber engages the rotation-inhibiting structures provided on the second shaft connection member to thereby inhibit rotation of the second shaft connection member with respect to the golf club head; (d) placing the securing member into the second end of the shaft-receiving chamber; and (e) releasably engaging the securing member with a securing structure provided with the second shaft connection member to thereby releasably engage the second shaft connection member with the golf club head. In a similar manner to that described above, a given shaft (and shaft connection member) may be readily disengaged from a club head and engaged with a different club head in accordance with still additional aspects of this invention.

**[0027]** Specific examples of the invention are described in more detail below. The reader should understand that these specific examples are set forth merely to illustrate examples of the invention, and they should not be construed as limiting the invention.

### C. Specific Examples of the Invention

**[0028]** Fig. 1 generally illustrates an example golf club 100 in accordance with at least some examples of this invention. This club 100 includes a club head 102, a releasable club head/shaft connection region 104 that connects the club head to a shaft 106 (which will be described in more detail below), and a grip member 108 engaged with the shaft 106. While a driver/wood-type golf club head 102 is illustrated in Fig. 1, aspects of this invention may be applied to any type of club head, including, for example: fairway wood club heads; iron type golf club heads (of any desired loft, e.g., from a 0-iron or 1-iron to a wedge); wood or iron type hybrid golf club heads; putter heads; and the like. The club heads may be made from any desired materials, in any desired construction and/or in any desired manner, including from conventional materials, in conventional constructions, in conventional

manners, as are known and used in the art, optionally modified (if necessary, *e.g.*, in size, shape, inclusion of structures, etc.) to accommodate the releasable club head/shaft connection parts.

**[0029]** Any desired materials also may be used for the shaft member 106, including conventional materials that are known and used in the art, such as steel, graphite, polymers, composite materials, combinations of these materials, etc. Optionally, if necessary or desired, the shaft may be modified (*e.g.*, in size, shape, etc.) to accommodate the releasable club head/shaft connection parts. The grip member 108 may be engaged with the shaft 106 in any desired manner, including in conventional manners that are known and used in the art (*e.g.*, via cements or adhesives, via mechanical connections, etc.). Any desired materials may be used for the grip member 108, including conventional materials that are known and used in the art, such as rubber, polymeric materials, cork, rubber or polymeric materials with cord or other fabric elements embedded therein, cloth or fabric, tape, etc. Optionally, if desired, the grip member 108 may be releasably connected to the shaft 106 using a releasable connection like releasable connection 104 (examples of which will be described in more detail below).

**[0030]** The releasable connection 104 between golf club heads and shafts in accordance with examples of this invention now will be described in more detail in conjunction with Figs. 2A through 3E. Figs. 2A through 2C illustrate an example club head/shaft connection member 200 in accordance with this invention. As shown, the club head/shaft connection member 200 includes a generally cylindrical body 202 having a first end 204 and an opposite second end 206. The first end 204 defines an opening to an interior cylindrical chamber 208 for receiving the end of a golf club shaft 106. The second end 206 includes a securing structure (*e.g.*, a threaded hole 210 in this example structure) that assists in securely engaging the connection member 200 to a club head body as will be explained in more detail below. In this example structure, as shown in Fig. 2B, the interior chamber 208 is not open to the threaded hole 210, but if desired, the threaded hole 210 may extend to and open in to the interior chamber 208 in some structures in accordance with this invention.

**[0031]** As shown, a least a portion of the first end 204 of the connection assembly 200 includes a rotation-inhibiting structure 212. While a variety of rotation-inhibiting structures may be provided without departing from this invention, in this example structure, the rotation-inhibiting structure 212 constitutes a cylindrical area having a non-round cross section such that when it is fit into a close fitting and similarly shaped opening or chamber, the non-rounded sides and edges of the rotation-inhibiting structure 212 will prevent rotation of the connection assembly 200 with respect to the member into which it is fit (*e.g.*, a golf club head, as will be explained in more detail below). While a variety of non-rounded cross sectional

structures may be used without departing from the invention, in the illustrated example, a portion of the first end 204 of the cylindrical body 202 has a polygon shaped cross section having plural (eight) flat sides 212a.

**[0032]** The rotation-inhibiting structure 212 may extend along any desired portion of the overall longitudinal length L of the connection assembly 200. For example, the length  $\ell$  of the rotation-inhibiting structure 212 may be less than 65% of the overall length L of the connection assembly 200, and in some examples, it may be less than 50%, less than 35%, or even less than 25% of the overall axial length L. On the other hand, rotation-inhibiting structure 212 may extend along any desired portion of the overall longitudinal length L of the connection assembly 200. For example, the rotation-inhibiting structure 212 should be of sufficient length l to enable strong and secure engagement with the club head in a non-rotational manner. As some more specific examples, the length l may be at least 2% of the overall length L of the connection assembly 200, and in some examples at least 5%, at least 10%, or even least 20% of the overall axial length L. If desired, the rotation-inhibiting structure 212 may extend from 2-65% of the overall axial length L of the connection assembly 200, or even from 5-50% or 10-35% of the overall length L.

**[0033]** Figs. 2A through 2C further illustrate that the first end 204 of the club head/shaft connection member 200 includes an expanded portion 214. As will be more apparent from Figs. 3A through 3E, this expanded portion 214 provides a stop that prevents the connection member 200 from extending into the club head body and provides a strong base for securing the connection member 200 to the club head body. Also, the exterior shape of the first end 204 may be tapered to provide a smooth transition between the shaft 106 and the club head 102 and a conventional aesthetic appearance.

**[0034]** Other features of this example connection member structure 200 may be seen from Figs. 2A through 2C. For example, in this example structure 200, which is not in accordance with the invention, the threaded hole 210 of the securing structure (in the second end 206 of the connection member 200) is coaxial with the cylindrical interior chamber 208 (see common axial line 216) and coaxial with respect to the exterior surface 218. These features are not requirements. Rather, in accordance with the invention, if desired, one of these cylindrical holes 208 and 210 may be offset (and still parallel) with respect to the other and/or with respect to the exterior surface 218. As another example in accordance with the invention, if desired (and as illustrated in Figs. 6A and 6B), one hole may be angled with respect to the other and/or with respect to the exterior surface 218. As still another example, if desired, multiple threaded holes (or other securing structures) may be included at the second end 206 to enable engagement with multiple bolts (or other securing systems).

**[0035]** The connection member 200 may be made from any desired materials and from any desired number of

independent parts without departing from this invention. In this illustrated example, the entire connection member 200 is made as a unitary, one-piece construction from conventional materials, such as metals or metal alloys, plastics, and the like. In at least some example structures according to this invention, the connection member will be made from a titanium, aluminum, magnesium, steel, or other metal or metal alloy material. The various holes (e.g., chamber 208 and threaded opening 210) and/or surface structures (e.g., flat panels 212a, expanded portions) may be produced in the material in any desired manner without departing from the invention, including via production methods that are commonly known and used in the art, such as by drilling, tapping, machining, lathing, extruding, grinding, etc.

**[0036]** One example of engagement of a golf club shaft 106 with a club head 102 utilizing connection assembly 200 now will be described in more detail in conjunction with Figs. 3A through 3E. At some time during the head/shaft connection process, a shaft 106 is engaged within the cylindrical interior chamber 208 of the connection assembly 200. In this illustrated example structure 200, the shaft 106 will be permanently engaged in the chamber 208, e.g., via an adhesive or cement bond. Other ways of engaging a shaft 106 with the connection assembly 200 are possible without departing from this invention, including, for example, mechanical connections (including releasable mechanical connections, such as threaded structures or the like); welding, brazing, soldering, or other fusing techniques; etc. Once connected to the connection assembly 200, the shaft 106 is ready for mounting to a golf club head 102. Alternatively, if desired, the shaft 106 may be connected to the connection member 200 later in the process, even as late as the final step in the connection process.

**[0037]** An example club head structure 102 now will be described in more detail, particularly in conjunction with Figs. 3A and 3B (Fig. 3B provides an overhead view of the club head 102, without a shaft 106 engaged therewith, looking down the hosel opening). In this example structure, the club head 102 includes a hosel area 302 that provides access to a shaft-receiving chamber 304 defined in the club head 102. The shaft-receiving chamber 304 in this example structure extends completely through the club head body 102 and produces an opening 306 at the sole of the club head 102. This opening 306 allows access for insertion of a securing system 308 (e.g., a threaded bolt member) that helps secure the connection system 200 to the club head body 102, as will be described in more detail below. In this example structure, the shaft-receiving chamber 304 includes a mounting plate 310 with a hole 310a defined therein, which provides a support surface for securing the connection system 200 within the club head body 102, as will be explained in more detail below. If desired, the mounting plate 310 may be integrally formed as part of the club head structure, and it may be located at any desired position along the shaft-receiving chamber 304, including

right at or near the opening 306. Additionally or alternatively, if desired, a plug member may be provided close to opening 306 (optionally a removable plug member) or the sole member may include a countersunk region to allow the bolt member 308 to lie flush or substantially flush with the club head sole.

**[0038]** The upper opening for the shaft-receiving chamber 304 in this example structure has rotation-inhibiting structures 312. While a variety of rotation-inhibiting structures 312 may be used without departing from the invention, in this example structure, the rotation-inhibiting structure 312 constitutes an opening having a plurality of flat sides or edges 312a that generally correspond to the size, shape, and location of the rotation-inhibiting structure 212 (and flat panels 212a) of the connection member 200 (e.g., having a non-round opening, and in this illustrated example, a polygonal opening with flat sides or edges 312a). As noted above, a variety of rotation-inhibiting structures 312 and/or 212 may be used without departing from this invention.

**[0039]** Connection of the connection assembly 200 (optionally with a shaft 106 already engaged with it) to the club head 102 will be described in more detail in conjunction with Figs. 3A, 3C, 3D, and 3E. As shown, the cylindrical body 202 of the connection member 200 is inserted into the shaft-receiving chamber 304 of the club head body 102 in an appropriate manner such that the rotation-inhibiting structures 212a of the connection member 200 engage the rotation-inhibiting structures 312a of the hosel 302. At this location and in this arrangement, the second end 206 of the connection member 200 is seated against the mounting plate 310 and/or the expanded portion 214 of the connection member 200 first end 204 is seated against the top surface of the hosel 302 opening.

**[0040]** Once inserted, the connection assembly 200 may be engaged with the club head body by inserting the securing system 308 through the opening 306 in the sole of the club head and engaging the securing system 308 with the securing structure 210 provided with the connection member 200. If desired, the locations where the connection member 200 meet the club head 102 (e.g., at mounting plate 310 and/or the hosel opening) and/or where the securing system 308 meets the club head 102 (e.g., at the mounting plate 310) may include a flexible material (such as a washer, a gasket, an o-ring, an elastomeric washer or coating, etc.) to provide noise and/or vibration dampening, etc. This illustrated connection system is readily releasable, e.g., by twisting out the bolt member 308, to allow users to interchange different shafts 106 on a given golf club head 102 and/or to allow users to interchange different golf club heads 102 on a given shaft/connection member assembly. If desired, the bolt 308 and mounting plate opening 310a may be structured so as to prevent the bolt 308 from completely falling out of the opening 306 when the bolt 308 is released from the connection system 200 (e.g., by providing an enlarged ring on the free end of bolt 308). The bolt may

include a head having structures for engaging a screwdriver, an allen wrench, or another tool.

**[0041]** As will be explained in more detail below in conjunction with Figs. 4A through 6B, adjustment of the rotational position of the connection system 200 (and its attached shaft 106) with respect to the golf club head 102 may be used in at least some examples of this invention to adjust various features of the overall golf club, such as loft angle, lie angle, inset distance, offset distance, to fade bias, to draw bias, etc. To enable users to easily identify the club head's "settings" (e.g., the club head body 102 position and/or orientation with respect to the shaft 106), any or all of the shaft 106, the connection member 200, and/or the club head 102 may include markings or indicators. Figs. 2A and 3A shows an indicator 220 on the connection system 200 (e.g., on the expanded portion 214), and Fig. 3A shows plural indicators 320 on the hosel area 302 of the club head 102. By noting the relative positions of the various indicators, a club fitter or other user can readily determine and know the position of the shaft with respect to the club head body 102 and its ball striking face. If desired, the indicators (e.g., indicators 320) may be associated with and/or include specific quantitative information, such as a specifically identified loft angle, lie angle, inset distance offset distance etc.

**[0042]** Additional aspects of this invention relate to utilizing releasable golf club head/shaft connection assemblies to enable club fitters (or others) to adjust various positions and/or angles of the club head (and its ball striking face) with respect to the free (grip) end of the shaft (e.g., lie angle, loft angle, etc.). Figs. 4A and 4B illustrate one example golf club head/shaft connection system 400 in which these angles can be controlled and adjusted. More specifically, Figs. 4A and 4B illustrate a releasable golf club head/shaft connection assembly 200 similar to that described above in conjunction with Figs. 1 through 3E (the same or similar reference numbers are used in Figs. 4A and 4B as those used in Figs. 1 through 3E to denote the same or similar parts). The shaft 402, however, in this example structure 400, is bent so as to include a first axial direction 404 extending coaxial with the interior chamber 208 of the connection member 200 and a second axial direction 406 extending along a major portion of the shaft 402. The axial direction change region 408 (optionally an abrupt bend or a continuous and/or smooth change) transitions the shaft axial direction from the first direction 404 to the second direction 406.

**[0043]** As evident from a comparison of Figs. 4A and 4B, the angle and/or position of the free end of the shaft 402 (at the location of the grip, remote from the connection assembly 200) may be altered with respect to the club head 102 (and with respect to the ball striking face) by rotating the connection member 200 with respect to the club head (note the changed location of the position indicator 220 of the connection member 200 in Figs. 4A and 4B). For ease in illustration, the club head structure is not shown in Figs. 4A and 4B, but its location with

respect to connection member 200 is readily evident from the previously described figures. This bent shaft feature, along with the releasable connection system 200 (e.g., via releasable securing system features 210 and 308), allows club fitters (or others) to freely and easily adjust various angles and/or positions of the shaft 402 with respect to the club head 102 (e.g., variable lie, loft, and face angle combinations) while still using the same shaft 402 and head 102, which can help users more easily determine the optimum club head/shaft combination and arrangement to suit their needs.

**[0044]** The axial direction change region 408 may be located at any desired position along the shaft 402 without departing from this invention. In at least some example structures 400 according to this aspect of the invention, the axial direction change region 408 will be located in the lower half of the shaft 402 nearer to the club head 102 than to the grip end. In some more specific examples, the axial direction change region 408 will be located in the lower quarter of the shaft 402 nearest to the club head 102, and even in the lower 10% or even 5% of the shaft 402 nearest to the club head 102. In some example structures 400 according to the invention, the bend or other axial direction change region 408 may be located as close to the connection member 200 or other portion of the club head as possible.

**[0045]** Also, any desired axial direction change  $\theta$  (or bend) angle may be used without departing from this invention, e.g., at least 0.25 degrees, at least 0.5 degrees, at least 1 degree, at least 2 degrees, at least 4 degrees, or even at least 8 degrees. In some example structures, this bend or other axial direction change will be between 0.25 and 25 degrees, between 0.5 and 15 degrees, between 1 and 10 degrees, or even between 1 and 5 degrees.

**[0046]** Aspects of this invention are not limited to golf club shafts having a single axial direction change region. Rather, as illustrated by the structure 500 shown in Fig. 5A, the shaft 502 may have multiple axial direction change regions (e.g., regions 504 and 506 in Fig. 5A (in Fig. 5A, the same or similar reference numbers are used as those used in Figs. 1 through 4B to denote the same or similar parts)). This double bend feature allows further fine tuning or control of the position and/or angle of the free end of the shaft 502 (at the grip) with respect to the club head 102 and its ball striking face (e.g., to adjust positions to provide a range of inset, outset, onset, and offset positions and/or optionally to adjust lie, loft, and/or face angle features). For simplicity in illustration, the club head 102 is not shown in Fig. 5A.

**[0047]** Fig. 5B illustrates another example structure 520 including a releasable golf club head/shaft connection assembly (e.g., like assembly 200) and a shaft 522 having two (or more) axial direction change regions 504 and 506 like those illustrated in Fig. 5A. In this example structure 520, however, the shaft 522 has more abrupt direction changes as compared to the structure 500 and shaft 502 of Fig. 5A. This shaft structure 522 also allows

control of the position and/or angle of the free end of the shaft 522 (at the grip) with respect to the club head 102 and its ball striking face (*e.g.*, to adjust positions to provide a range of inset, outset, onset, and offset positions and/or optionally to adjust lie, loft and/or for angle features).

**[0048]** The axial direction change regions 504 and 506 in the various structures (*e.g.*, structures 500 and 520) may be located at any desired positions along the shafts 502 and/or 522 and/or at any desired relative spacing with respect to one another without departing from this invention. In at least some example structures 500 and/or 520 according to this invention, at least one of the axial direction change regions 504 and 506 (and optionally both) will be located in the lower half of the shaft 502 and/or 522 nearer to the club head 102 than to the grip end. In some more specific examples, one or both of the axial direction change regions 504 and 506 will be located in the lower quarter of the shaft 502 and/or 522 nearest to the club head 102, and even in the lower 10% or 5% of the shaft 502 and/or 522 nearest to the club head 102. The axial direction change regions 504 and 506 may be separated from one another by at least ½ inch, at least 1 inch, at least 2 inches, or even at least 4 inches or more without departing from this invention.

**[0049]** Also, any desired axial direction change (or bend) angles may be used for each of the two (or more) direction changes without departing from this invention, *e.g.*, at least 0.25 degrees, at least 0.5 degrees, at least 1 degree, at least 2 degrees, at least 4 degrees, or even at least 8 degrees. In some example structures, like those shown in Fig. 5A, these bends or other axial direction changes will be between 0.25 and 25 degrees, between 0.5 and 15 degrees, between 1 and 10 degrees, or even between 1 and 5 degrees. In other example structures, like those shown in Fig. 5B, these bends or other axial direction changes will be between 25 and 145 degrees, between 30 and 120 degrees, between 45 and 100 degrees, or even between 60 and 90 degrees. If desired, one bend may be relatively slight (*e.g.*, as shown in Fig. 5A) while another is more abrupt (*e.g.*, as shown in Fig. 5B). The bends or axial direction changes 502 and 504 may be arranged so that the free ends of the shaft (and the shaft sections 524 and 526 including the free ends) lie on the same plane or on different planes. Also, if desired, more than two bends or axial direction change regions may be provided in a club head shaft structure without departing from this invention.

**[0050]** Utilizing a shaft including one or more axial direction change regions is not the only manner in which the position and/or angle of the free (grip) end of a shaft may be altered with respect to a golf club head and/or its ball striking face. Figs. 6A and 6B illustrate another example arrangement. In this example arrangement, the club head/shaft connection member 600 includes an "off-axis" or angled bore hole or interior chamber 608 in which the shaft 106 (optionally a straight shaft) is received. More specifically, in this illustrated example, the outer cylindrical

surface 618 of the connection member 600 extends in a first axial direction 626, and the interior cylindrical surface 628 of the bore hole 608 extends in a second axial direction 630 that differs from the first axial direction 626. In this manner, while the shaft connection member 600 exterior maintains a constant axial direction corresponding to that of the interior of the club head hosel and its opening, the shaft 106 extends away from the club head 102 at a different and adjustable angle with respect to the club head 102 and its ball striking face (the shaft position and/or angle may be adjusted, for example, by rotating the shaft connection member 600 with respect to the club head hosel). This may be seen, for example, by a comparison of the angles of Figs. 6A and 6B.

**[0051]** While any desired angle may be maintained between the first axial direction 626 and the second axial direction 630, in accordance with some examples of this invention, this angle will be between 0.25 degrees and 10 degrees, and in some examples between 0.5 degrees and 8 degrees, between 0.75 degrees and 6 degrees, or even between 1 degree and 4 degrees.

**[0052]** As another example, if desired, the axial directions 626 and 630 may be parallel to one another but offset such that these directions are not coaxial. In this manner, various characteristics of the club may be changed by rotating the connection system 200 with respect to the club head (such as inset or outset dimensions, etc.).

**[0053]** Many variations in the overall structure of the shaft, club head, and club head/shaft connection assembly are possible. For example, if desired not in accordance with the invention, the connection system may be used to connect shafts to other elements of a golf club (or other) structure, such as connecting a golf club shaft to a grip element. Similar structures, not in accordance with the invention, also may be used to connect shafts to other pieces of athletic equipment or other equipment, if desired (not limited to golf clubs).

**[0054]** Additionally, the releasable connection assemblies may be used in any desired manner without departing from the invention. The clubs with such connection assemblies may be designed for use by the golfer in play (and optionally, if desired, the golfer may freely change shafts, heads, and/or their positioning with respect to one another). As another example, if desired, clubs including releasable connections in accordance with the invention may be used as club fitting tools and when the desired combination of head, shaft, and positioning have been determined for a specific golfer, a club builder may use the determined information to then produce a final desired golf club product using conventional (and permanent) mounting techniques (*e.g.*, cements or adhesives). Other variations in the club/shaft connection assembly parts and processes are possible without departing from the invention as defined in the appended claims.

## CONCLUSION

**[0055]** While the invention has been described in detail in terms of specific examples including presently preferred modes of carrying out the invention, those skilled in the art will appreciate that there are numerous variations and permutations of the above described systems and methods. Thus, the and scope of the invention should be construed as set forth in the appended claims.

## Claims

1. A golf club head/shaft connection assembly, comprising:

a connection member (600) comprising a cylindrical structure having a first end and a second end opposite the first end, wherein the first end includes a first opening that defines a cylindrical interior chamber (608) for receiving a golf club shaft (106), wherein an exterior surface of the cylindrical structure nearer to the first end than the second end includes a rotation-inhibiting structure, and wherein the first end includes an expanded portion to provide a stop that prevents the connection member (600) from fully extending into a club head body (102), and wherein the second end includes a securing structure, and wherein the cylindrical interior chamber (608) extends towards the second end axially beyond the rotation-inhibiting structure; and a securing system for releasably engaging the securing structure, wherein the securing structure includes a threaded hole defined in the second end of the cylindrical structure and the securing system includes a threaded bolt element that engages the threaded hole, wherein the cylindrical structure extends in a first axial direction (626) and the cylindrical interior chamber (608) extends in a second axial direction (630) that differs from the first axial direction (626), and wherein the threaded hole does not axially align with the second axial direction (630).

2. A golf club head/shaft connection assembly according to claim 1, wherein:

(1) the rotation-inhibiting structure includes plural flat sides that extend in an axial direction of the cylindrical structure; or  
 (2) a portion of the exterior surface in a longitudinal direction of the cylinder structure has a non-round cross section to thereby provide the rotation-inhibiting structure.

3. A golf club head/shaft connection assembly accord-

ing to claim 1, wherein a portion of the exterior surface in a longitudinal direction of the cylinder structure has a polygonal shaped cross section to thereby provide the rotation-inhibiting structure.

4. A golf club head/shaft connection assembly according to claim 1, wherein:

(1) the rotation-inhibiting structure extends less than 35% of an overall axial length of the cylindrical structure; or  
 (2) the exterior surface of the cylindrical structure at the first end includes a tapered portion that tapers from a narrower width at the first end to a wider width proximate to a location where the rotation-inhibiting structure begins on the exterior surface, and wherein the exterior surface of the cylindrical structure abruptly changes width in an axial direction thereof such that the exterior surface abruptly changes width from the wider width to a narrower width corresponding to the rotation-inhibiting structure.

5. A golf club head/shaft connection assembly according to claim 1, wherein the exterior surface of the cylindrical structure at the first end includes a rotational position indicator located between the first end and a location where the rotation-inhibiting structure begins.

6. A golf club (100), comprising:

a golf club head (102) having a shaft-receiving chamber (304), wherein a first end of the shaft-receiving chamber (304) includes a first rotation-inhibiting structure (312) and a second end of the shaft-receiving chamber (304) includes a first opening for receiving a securing member (308); a shaft connection member (600) extending into the shaft-receiving chamber (304) of the golf club head, the shaft connection member (600) including a cylindrical structure having a first end and a second end opposite the first end, wherein the first end of the shaft connection member (600) includes a second opening that defines a cylindrical interior chamber (608) for receiving a golf club shaft (106), wherein an exterior surface of the cylindrical structure nearer to its first end than its second end includes a second rotation-inhibiting structure that engages the first rotation-inhibiting structure (312), wherein the first end includes an expanded portion to provide a stop that prevents the shaft connection member (600) from fully extending into the club head (102), and wherein the second end includes a securing structure, and wherein the cylindrical interior chamber (608) extends towards the second end axially beyond the rota-

tion-inhibiting structure;

a shaft (106) engaged in the cylindrical interior chamber (608) of the shaft connection member (600), wherein an end of the shaft (106) extends axially toward the second end of the shaft connection member (600) beyond the second rotation-inhibiting structure; and

a securing member (308) extending into the second end of the shaft-receiving chamber (304) of the golf club head (102) and releasably engaging the securing structure of the shaft connection member (600) to thereby releasably engage the shaft connection member (600) with the golf club head (102), wherein the securing structure of the shaft connection member (600) includes a threaded hole defined in the second end of the cylindrical structure and the securing member (600) includes a threaded bolt element (308) that engages the threaded hole, and wherein the threaded bolt element (308) releasably engages the golf club head (102) to hold the shaft connection member (600) in place with respect to the golf club head (102), and wherein the cylindrical structure extends in a first axial direction (626) and the cylindrical interior chamber (608) extends in a second axial direction (630) that differs from the first axial direction (626), and wherein the threaded hole does not axially align with the second axial direction (630).

7. A golf club according to claim 6, wherein:

at least a portion of the first end of the shaft-receiving chamber includes an opening having a non-round cross section to thereby provide the first rotation-inhibiting structure, and wherein a portion of the exterior surface in a longitudinal direction of the cylinder structure of the shaft connection member has a mating and correspondingly shaped non-round cross section to thereby provide the second rotation-inhibiting structure.

8. A golf club according to claim 6, wherein at least a portion of the first end of the shaft-receiving chamber includes an opening having a polygonal shaped cross section to thereby provide the first rotation-inhibiting structure, and wherein a portion of the exterior surface in a longitudinal direction of the cylinder structure of the shaft connection member has a mating and correspondingly shaped polygonal shaped cross section to thereby provide the second rotation-inhibiting structure.

9. A golf club according to claim 6, wherein:

(1) a portion of the first end shaft connection member remains outside of the shaft-receiving

chamber of the golf club head, and wherein the second rotation-inhibiting structure extends into the shaft receiving chamber and engages the first rotation-inhibiting structure;

(2) the first opening of the shaft receiving chamber is located at a sole surface of the golf club head; or

(3) the shaft-receiving chamber includes an interior surface through which the first opening of the shaft-receiving chamber is defined.

10. A golf club according to claim 6, wherein the exterior surface of the cylindrical structure proximate the first end of the shaft connection member includes a first rotational position indicator, wherein the first rotational position indicator is located on the exterior surface between the first end of the shaft connection member and a location where the second rotation-inhibiting structure begins, and wherein the golf club head includes a second rotational position indicator located proximate to the shaft-receiving chamber.

11. A golf club according to claim 6, wherein the shaft includes a shaft axial direction change region.

12. A golf club according to claim 6, wherein the shaft includes at least two shaft axial direction change regions.

13. A method of producing a golf club head/shaft connection assembly, comprising:

producing a shaft connection member (600) as a cylindrical structure having a first end and a second end opposite the first end, wherein the first end includes an expanded portion to provide a stop that prevents the connection member from fully extending into a club head body (102); producing an open cylindrical interior chamber (608) for receiving a golf club shaft (106) at the first end of the shaft connection member (600); forming a rotation-inhibiting structure as part of an exterior surface of the cylindrical structure nearer to the first end than the second end, wherein the cylindrical interior chamber (608) extends toward the second end axially beyond the rotation-inhibiting structure; forming a securing structure at the second end of the shaft connection member (600); and providing a securing member (308) for engaging the securing structure, wherein the cylindrical structure extends in a first axial direction (626) and the cylindrical interior chamber (608) extends in a second axial direction (630) that differs from the first axial direction (626), and wherein the securing structure includes a threaded hole that does not axially align with the second axial direction (630).

14. A method of assembling a golf club (100), comprising:

providing a golf club head (102) having a shaft-receiving chamber (304), wherein a first end of the shaft-receiving chamber includes a first rotation-inhibiting structure (312) and a second end of the shaft-receiving chamber includes a first opening for receiving a securing member (308); engaging a shaft (106) with a shaft connection member (600), wherein the shaft connection member includes a cylindrical structure having a first end and a second end opposite the first end, wherein the first end of the shaft connection member includes a second opening that defines a cylindrical interior chamber for receiving a golf club shaft (106), wherein an exterior surface of the cylindrical structure nearer to its first end than its second end includes a second rotation-inhibiting structure that engages the first rotation-inhibiting structure (312), wherein the first end includes an expanded portion to provide a stop that prevents the shaft connection member from fully extending into the club head, and wherein the second end of the shaft connection member includes a securing structure, wherein the cylindrical interior chamber extends toward the second end of the shaft connection member axially beyond the second rotation-inhibiting structure, and wherein an end of the shaft extends within the cylindrical interior chamber and toward the second end of the shaft connection member to a location axially beyond the second rotation-inhibiting structure; placing at least a portion of the shaft connection member into the shaft-receiving chamber of the golf club head such that the first rotation-inhibiting structure engages the second rotation-inhibiting structure to inhibit rotation of the shaft connection member with respect to the golf club head; placing a securing member (308) into the second end of the shaft-receiving chamber; and releasably engaging the securing member with the securing structure of the shaft connection member to thereby releasably engage the shaft connection member with the golf club head, wherein the cylindrical structure extends in a first axial direction (626) and the cylindrical interior chamber extends in a second axial direction (630) that differs from the first axial direction.

15. A method according to claim 14, further comprising:

releasing the shaft connection member with respect to the golf club head;  
engaging a second shaft with a second shaft connection member, wherein the second shaft

connection member includes a cylindrical structure having a first end and a second end opposite the first end, wherein the first end of the second shaft connection member includes a second opening that defines a cylindrical interior chamber for receiving a golf club shaft, wherein an exterior surface of the cylindrical structure of the second shaft connection member nearer to its first end than its second end includes a third rotation-inhibiting structure, and wherein the second end of the second shaft connection member includes a second securing structure;  
placing at least a portion of the second shaft connection member into the shaft-receiving chamber of the golf club head such that the first rotation-inhibiting structure engages the third rotation-inhibiting structure to inhibit rotation of the second shaft connection member with respect to the golf club head;  
placing the securing member into the second end of the shaft-receiving chamber; and  
releasably engaging the securing member with the second securing structure of the second shaft connection member to thereby releasably engage the second shaft connection member with the golf club head.

16. A method according to claim 14, further comprising:

(1) releasing the shaft connection member with respect to the golf club head and releasably engaging an assembly including a second shaft with the shaft-receiving chamber of the golf club head; or  
(2) disengaging the shaft connection member from the golf club head, changing a position of the shaft connection member with respect to the golf club head to thereby alter a position of a free end of the shaft with respect to a ball striking face of the club head;  
(3) and releasably engaging the securing member with the securing structure of the shaft connection member to thereby releasably engage the shaft connection member with respect to the golf club head at the changed position.

#### Patentansprüche

1. Golfschläger-Kopf/Schaft-Verbindungsanordnung mit:

einem Verbindungsglied (600), das eine zylindrische Struktur mit einem ersten Ende und einem zweiten, dem ersten Ende gegenüberliegenden Ende aufweist, wobei das erste Ende eine erste Öffnung aufweist, die eine zylindrische innere Kammer (608) zur Aufnahme eines

- Golfschlägerschaftes (106) bestimmt, wobei eine Außenfläche der zylindrischen Struktur näher an dem ersten Ende als an dem zweiten Ende eine Drehungs-Hemmstruktur aufweist, und wobei das erste Ende einen erweiterten Abschnitt aufweist, um einen Anschlag bereitzustellen, der verhindert, dass das Verbindungsglied (600) sich vollständig in einen Schlägerkopfkörper (102) erstreckt, und wobei das zweite Ende eine Sicherungsstruktur aufweist, und wobei die zylindrische innere Kammer (608) sich in Richtung des zweiten Endes axial über die Drehungs-Hemmstruktur hinaus erstreckt; und
- einem Sicherungssystem zum lösbaren Zusammengreifen mit der Sicherungsstruktur, wobei die Sicherungsstruktur eine Gewindebohrung aufweist, die in dem zweiten Ende der zylindrischen Struktur bestimmt ist, und das Sicherungssystem ein Gewindebolzenelement aufweist, das mit der Gewindebohrung zusammengreift,
- wobei die zylindrische Struktur sich in einer ersten axialen Richtung (626) erstreckt und die zylindrische innere Kammer (608) sich in einer zweiten axialen Richtung (630) erstreckt, die von der ersten axialen Richtung (626) abweicht, und wobei die Gewindebohrung axial nicht mit der zweiten axialen Richtung (630) ausgerichtet ist.
2. Golfschläger-Kopf/Schaft-Verbindungsanordnung gemäß Anspruch 1, bei der:
- (1) die Drehungs-Hemmstruktur mehrere flache Seiten aufweist, die sich in einer axialen Richtung der zylindrischen Struktur erstrecken; oder
- (2) ein Abschnitt der Außenfläche in einer Längsrichtung der Zylinderstruktur einen nicht-runden Querschnitt hat, um dadurch die Drehungs-Hemmstruktur bereitzustellen.
3. Golfschläger-Kopf/Schaft-Verbindungsanordnung gemäß Anspruch 1, bei der ein Abschnitt der Außenfläche in einer Längsrichtung der Zylinderstruktur einen vieleckigen Querschnitt hat, um dadurch die Drehungs-Hemmstruktur bereitzustellen.
4. Golfschläger-Kopf/Schaft-Verbindungsanordnung gemäß Anspruch 1, bei der:
- (1) die Drehungs-Hemmstruktur sich über weniger als 35% einer gesamten axialen Länge der zylindrischen Struktur erstreckt oder
- (2) die Außenfläche der zylindrischen Struktur an dem ersten Ende einen zulaufenden Abschnitt aufweist, der von einer schmalen Breite an dem ersten Ende zu einer breiteren Breite
- in der Nähe einer Stelle, wo die Drehungs-Hemmstruktur an der Außenfläche beginnt, schräg verläuft, und wobei die Außenfläche der zylindrischen Struktur in einer axialen Richtung derselben in der Weise abrupt die Breite wechselt, dass die Außenfläche abrupt von der breiteren Breite zu einer schmalen Breite wechselt, die der Drehungs-Hemmstruktur entspricht.
5. Golfschläger-Kopf/Schaft-Verbindungsanordnung gemäß Anspruch 1, bei der die Außenfläche der zylindrischen Struktur an dem ersten Ende einen Drehpositionsanzeiger aufweist, der sich zwischen dem ersten Ende und einer Stelle befindet, wo die Drehungs-Hemmstruktur beginnt.
6. Golfschläger (100) mit:
- einem Golfschlägerkopf (102) mit einer Schaftaufnahmekammer (304), wobei ein erstes Ende der Schaftaufnahmekammer (304) eine erste Drehungs-Hemmstruktur (312) aufweist und ein zweites Ende der Schaftaufnahmekammer (304) eine erste Öffnung zur Aufnahme eines Sicherungsgliedes (308) aufweist;
- einem Schaftverbindungsglied (600), das sich in die Schaftaufnahmekammer (304) des Golfschlägerkopfes erstreckt, wobei das Schaftverbindungsglied (600) eine zylindrische Struktur mit einem ersten Ende und einem zweiten, dem ersten Ende gegenüberliegenden Ende aufweist, wobei das erste Ende des Schaftverbindungsgliedes (600) eine zweite Öffnung aufweist, die eine zylindrische innere Kammer (608) zur Aufnahme eines Golfschlägerschaftes (106) bestimmt,
- wobei eine Außenfläche der zylindrischen Struktur näher an ihrem ersten Ende als an ihrem zweiten Ende eine zweite Drehungs-Hemmstruktur aufweist, die mit der ersten Drehungs-Hemmstruktur (312) zusammengreift, wobei das erste Ende einen erweiterten Abschnitt aufweist, um einen Anschlag bereitzustellen, der verhindert, dass das Verbindungsglied (600) sich vollständig in einen Schlägerkopfkörper (102) erstreckt, und wobei das zweite Ende eine Sicherungsstruktur aufweist, und wobei die zylindrische innere Kammer (608) sich in Richtung des zweiten Endes axial über die Drehungs-Hemmstruktur hinaus erstreckt;
- einem Schaft (106), der in der zylindrischen inneren Kammer (608) des Schaftverbindungsgliedes (600) in Zusammengriff steht, wobei ein Ende des Schaftes (106) sich axial in Richtung des zweiten Endes des Schaftverbindungsgliedes (600) über die zweite Drehungs-Hemmstruktur hinaus erstreckt; und

- einem Sicherungsglied (308), das sich in das zweite Ende der Schaftaufnahmekammer (304) des Golfschlägerkopfes (102) erstreckt und lösbar mit der Sicherungsstruktur des Schaftverbindungsgliedes (600) zusammengreift, um dadurch das Schaftverbindungsglied (600) mit dem Golfschlägerkopf (102) lösbar in Zusammengriff zu bringen, wobei die Sicherungsstruktur des Schaftverbindungsgliedes (600) eine Gewindebohrung aufweist, die in dem zweiten Ende der zylindrischen Struktur bestimmt ist, und das Sicherungsglied (600) ein Gewindebolzenelement (308) aufweist, das mit der Gewindebohrung zusammengreift, und wobei das Gewindebolzenelement (308) mit dem Golfschlägerkopf (102) lösbar zusammengreift, um das Schaftverbindungsglied (600) in Bezug auf den Golfschlägerkopf (102) in Position zu halten, und wobei die zylindrische Struktur sich in einer ersten axialen Richtung (626) erstreckt und die zylindrische innere Kammer (608) sich in einer zweiten axialen Richtung (630) erstreckt, die von der ersten axialen Richtung (626) abweicht, und wobei die Gewindebohrung nicht axial mit der zweiten axialen Richtung (630) ausgerichtet ist.
7. Golfschläger gemäß Anspruch 6, bei dem:
- mindestens ein Abschnitt des ersten Endes der Schaftaufnahmekammer eine Öffnung aufweist, die einen nicht-runden Querschnitt hat, um dadurch die erste Drehungs-Hemmstruktur bereitzustellen, und wobei ein Abschnitt der Außenfläche in einer Längsrichtung der Zylinderstruktur des Schaftverbindungsgliedes einen passenden und entsprechend geformten nicht-runden Querschnitt hat, um dadurch die zweite Drehungs-Hemmstruktur bereitzustellen.
8. Golfschläger gemäß Anspruch 6, bei dem mindestens ein Abschnitt des ersten Endes der Schaftaufnahmekammer eine Öffnung aufweist, die einen viereckigen Querschnitt hat, um dadurch die erste Drehungs-Hemmstruktur bereitzustellen, und wobei ein Abschnitt der Außenfläche in einer Längsrichtung der Zylinderstruktur des Schaftverbindungsgliedes einen passenden und entsprechend geformten viereckigen Querschnitt hat, um dadurch die zweite Drehungs-Hemmstruktur bereitzustellen.
9. Golfschläger gemäß Anspruch 6, bei dem:
- (1) ein Abschnitt des ersten Endes des Schaftverbindungsgliedes außerhalb der Schaftaufnahmekammer des Golfschlägerkopfes bleibt, und wobei die zweite Drehungs-Hemmstruktur sich in die Schaftaufnahmekammer erstreckt und mit der ersten Drehungs-Hemmstruktur zusammengreift;
- (2) die erste Öffnung der Schaftaufnahmekammer sich an einer Sohlenoberfläche des Golfschlägerkopfes befindet; oder
- (3) die Schaftaufnahmekammer eine Innenfläche aufweist, durch welche die erste Öffnung der Schaftaufnahmekammer bestimmt ist.
10. Golfschläger gemäß Anspruch 6, bei dem die Außenfläche der zylindrischen Struktur in der Nähe des ersten Endes des Schaftverbindungsgliedes einen ersten Drehpositionsanzeiger aufweist, wobei der erste Drehpositionsanzeiger sich an der Außenfläche zwischen dem ersten Ende des Schaftverbindungsgliedes und einer Stelle befindet, wo die zweite Drehungs-Hemmstruktur beginnt, und wobei der Golfschlägerkopf einen zweiten Drehpositionsanzeiger aufweist, der sich in der Nähe der Schaftaufnahmekammer befindet.
11. Golfschläger gemäß Anspruch 6, bei dem der Schaft eine Schaft-Axialrichtungs-Änderungsregion aufweist.
12. Golfschläger gemäß Anspruch 6, bei dem der Schaft mindestens zwei Schaft-Axialrichtungs-Änderungsregionen aufweist.
13. Verfahren zur Herstellung einer Golfschlägerkopf/Schaft-Verbindungsanordnung, umfassend:
- Herstellen eines Schaftverbindungsgliedes (600) als zylindrische Struktur mit einem ersten Ende und einem zweiten, dem ersten Ende gegenüberliegenden Ende, wobei das erste Ende einen erweiterten Abschnitt aufweist, um einen Anschlag bereitzustellen, der verhindert, dass das Verbindungsglied sich vollständig in einen Schlägerkopfkörper (102) erstreckt,
- Herstellen einer offenen zylindrischen inneren Kammer (608) zur Aufnahme eines Golfschlägerschaftes (106) an dem ersten Ende des Schaftverbindungsgliedes (600);
- Bilden einer Drehungs-Hemmstruktur als Teil einer Außenfläche der zylindrischen Struktur näher an dem ersten Ende als an dem zweiten Ende, wobei die zylindrische innere Kammer (608) sich in Richtung des zweiten Endes axial über die Drehungs-Hemmstruktur hinaus erstreckt;
- Bilden einer Sicherungsstruktur an dem zweiten Ende des Schaftverbindungsgliedes (600) und Bereitstellen eines Sicherungsgliedes (308) zum Zusammengriff mit der Sicherungsstruktur, wobei die zylindrische Struktur sich in einer ersten axialen Richtung (626) erstreckt und die zy-

lindrische innere Kammer (608) sich in einer zweiten axialen Richtung (630) erstreckt, die von der ersten axialen Richtung (626) abweicht, und wobei die Sicherungsstruktur eine Gewindebohrung aufweist, die axial nicht mit der zweiten axialen Richtung (630) ausgerichtet ist.

**14.** Verfahren zum Zusammenbau eines Golfschlägers (100), umfassend:

Bereitstellen eines Golfschlägerkopfes (102) mit einer Schaftaufnahmekammer (304), wobei ein erstes Ende der Schaftaufnahmekammer eine erste Drehungs-Hemmstruktur (312) aufweist und ein zweites Ende der Schaftaufnahmekammer eine erste Öffnung zur Aufnahme eines Sicherungsgliedes (308) aufweist; In-Zusammengriff-Bringen eines Schaftes (106) mit einem Schaftverbindungsglied (600), wobei das Schaftverbindungsglied eine zylindrische Struktur mit einem ersten Ende und einem zweiten, dem ersten Ende gegenüberliegenden Ende aufweist, wobei das erste Ende des Schaftverbindungsgliedes eine zweite Öffnung aufweist, die eine zylindrische innere Kammer zur Aufnahme eines Golfschlägerschaftes (106) bestimmt, wobei eine Außenfläche der zylindrischen Struktur näher an ihrem ersten Ende als an ihrem zweiten Ende eine zweite Drehungs-Hemmstruktur aufweist, die mit der ersten Drehungs-Hemmstruktur (312) zusammengreift, wobei das erste Ende einen erweiterten Abschnitt aufweist, um einen Anschlag bereitzustellen, der verhindert, dass das Schaftverbindungsglied sich vollständig in den Schlägerkopfkörper erstreckt, und wobei das zweite Ende des Schaftverbindungsgliedes eine Sicherungsstruktur aufweist, wobei die zylindrische innere Kammer sich in Richtung des zweiten Endes des Schaftverbindungsgliedes axial über die zweite Drehungs-Hemmstruktur hinaus erstreckt, und wobei ein Ende des Schaftes sich innerhalb der zylindrischen inneren Kammer und in Richtung des zweiten Endes des Schaftverbindungsgliedes zu einer Stelle axial jenseits der zweiten Drehungs-Hemmstruktur erstreckt; Anordnen mindestens eines Abschnittes des Schaftverbindungsgliedes in der Schaftaufnahmekammer des Golfschlägerkopfes in der Weise, dass die erste Drehungs-Hemmstruktur mit der zweiten Drehungs-Hemmstruktur zusammengreift, um eine Drehung des Schaftverbindungsgliedes in Bezug auf den Golfschlägerkopf zu hemmen; Anordnen eines Sicherungsgliedes (308) in dem zweiten Ende der Schaftaufnahmekammer und lösbares In-Zusammengriff-Bringen des Sicherungsgliedes mit der Sicherungsstruktur des

Schaftverbindungsgliedes, um dadurch das Schaftverbindungsglied lösbar mit dem Golfschlägerkopf in Zusammengriff zu bringen, wobei die zylindrische Struktur sich in einer ersten axialen Richtung (626) erstreckt und die zylindrische innere Kammer sich in einer zweiten axialen Richtung (630) erstreckt, die von der ersten axialen Richtung abweicht.

**15.** Verfahren gemäß Anspruch 14, ferner umfassend:

Lösen des Schaftverbindungsgliedes in Bezug auf den Golfschlägerkopf; In-Zusammengriff-Bringen eines zweiten Schaftes mit einem zweiten Schaftverbindungsglied, wobei das zweite Schaftverbindungsglied eine zylindrische Struktur mit einem ersten Ende und einem zweiten, dem ersten Ende gegenüberliegenden Ende aufweist, wobei das erste Ende des zweiten Schaftverbindungsgliedes eine zweite Öffnung aufweist, die eine zylindrische innere Kammer zur Aufnahme eines Golfschlägerschaftes bestimmt, wobei eine Außenfläche der zylindrischen Struktur des zweiten Schaftverbindungsgliedes näher an ihrem ersten Ende als an ihrem zweiten Ende eine dritte Drehungs-Hemmstruktur aufweist, und wobei das zweite Ende des zweiten Schaftverbindungsgliedes eine zweite Sicherungsstruktur aufweist; Anordnen mindestens eines Abschnittes des zweiten Schaftverbindungsgliedes in der Schaftaufnahmekammer des Golfschlägerkopfes in der Weise, dass die erste Drehungs-Hemmstruktur mit der dritten Drehungs-Hemmstruktur zusammengreift, um eine Drehung des zweiten Schaftverbindungsgliedes in Bezug auf den Golfschlägerkopf zu hemmen; Anordnen des Sicherungsgliedes in dem zweiten Ende der Schaftaufnahmekammer und lösbares In-Zusammengriff-Bringen des Sicherungsgliedes mit der zweiten Sicherungsstruktur des zweiten Schaftverbindungsgliedes, um dadurch das zweite Schaftverbindungsglied lösbar mit dem Golfschlägerkopf in Zusammengriff zu bringen.

**16.** Verfahren gemäß Anspruch 14, ferner umfassend:

(1) Lösen des Schaftverbindungsgliedes in Bezug auf den Golfschlägerkopf und lösbares In-Zusammengriff-Bringen einer Anordnung, die einen zweiten Schaft aufweist, mit der Schaftaufnahmekammer des Golfschlägerkopfes; oder  
(2) Entkoppeln des Schaftverbindungsgliedes von dem Golfschlägerkopf, Verändern einer Position des Schaftverbindungsgliedes in Bezug

auf den Golfschlägerkopf, um dadurch eine Position eines freien Endes des Schaftes in Bezug auf eine Ballschlagfläche des Schlägerkopfes zu ändern;

(3) und lösbares In-Zusammengriff-Bringen des Sicherungsgliedes mit der Sicherheitsstruktur des Schaftverbindungsgliedes, um dadurch das Schaftverbindungsglied in Bezug auf den Golfschlägerkopf an der veränderten Position lösbar in Zusammengriff zu bringen.

## Revendications

1. Ensemble de connexion d'une tête et d'un shaft de club de golf comprenant :

un élément de connexion (600) comprenant :

une structure cylindrique ayant une première extrémité et une seconde extrémité opposée à la première extrémité,

la première extrémité comprenant une première ouverture qui définit une chambre cylindrique interne (608) permettant de recevoir un shaft de club de golf (106),

la surface externe de la structure cylindrique comprenant, plus près de la première extrémité que de la seconde extrémité une structure antirotation, et la première extrémité comportant une partie élargie permettant d'obtenir un arrêt qui empêche que l'élément de connexion (600) s'étende totalement dans le corps de la tête de club (102), et

la seconde extrémité comprenant une structure de retenue et la chambre cylindrique interne (608) s'étendant axialement vers la seconde extrémité au-delà de la structure anti-rotation, et

un système de retenue permettant de mettre en prise de façon amovible, la structure de retenue, la structure de retenue comprenant un perçage fileté défini dans la seconde extrémité de la structure cylindrique et le système de retenue comprenant un élément de boulon fileté qui vient en prise avec le perçage fileté,

la structure cylindrique s'étendant dans une première direction axiale (626) et la chambre cylindrique interne (608) s'étendant dans une seconde direction axiale (630) différente de la première direction axiale (626), et

le perçage fileté n'étant pas aligné axialement avec la seconde direction axiale (630).

2. Ensemble de connexion d'un shaft et d'une tête de

club de golf dans lequel :

(1) la structure antirotation comprend plusieurs côtés plats qui s'étendent dans la direction axiale de la structure cylindrique, ou

(2) une partie de la surface externe dans la direction longitudinale de la structure cylindrique a une section transversale non circulaire pour permettre ainsi d'obtenir la structure antirotation.

3. Ensemble de connexion d'un shaft et d'une tête de club de golf conforme à la revendication 1, dans lequel une partie de la surface externe, dans la direction longitudinale de la structure cylindrique a une section transversale de forme polygonale pour permettre ainsi d'obtenir la structure antirotation.

4. Ensemble de connexion d'un shaft et d'une tête de club de golf conforme à la revendication 1, dans lequel :

(1) la structure antirotation s'étend sur moins de 35% de la longueur axiale globale de la structure cylindrique, ou

(2) la surface externe de la structure cylindrique comporte à sa première extrémité, une partie en biais qui s'étend obliquement d'une plus petite largeur au niveau de la première extrémité à une plus grande largeur au voisinage de la position dans laquelle la structure anti-rotation commence sur la surface externe, la largeur de la surface externe de la structure cylindrique changeant brusquement en direction axiale de sorte que la largeur de la surface externe varie brusquement entre la plus grande largeur et la plus petite largeur correspondant à la structure antirotation.

5. Ensemble de connexion d'un shaft et d'une tête de club de golf conforme à la revendication 1, dans lequel la surface externe de la structure cylindrique comporte au niveau de la première extrémité un indicateur de position de rotation situé entre la première extrémité et la position dans laquelle la structure anti-rotation commence.

6. Club de golf (100) comprenant :

une tête de club de golf (102) comprenant une chambre de réception d'un shaft (304),

une première extrémité de la chambre de réception d'un shaft (304) comprenant une première structure antirotation (312) et une seconde extrémité de la chambre de réception d'un shaft (304) comprenant une première ouverture permettant de recevoir un élément de retenue (308),

un élément de connexion d'un shaft (600)

s'étendant dans la chambre de réception d'un shaft (304) de la tête de club de golf, l'élément de connexion d'un shaft (600) ayant une structure cylindrique ayant une première extrémité et une seconde extrémité opposée à la première extrémité, la première extrémité de l'élément de connexion d'un shaft (600) comprenant une seconde ouverture qui définit une chambre cylindrique interne (608) permettant de recevoir un shaft de club de golf (106), la surface externe de la surface cylindrique, comprenant plus près de sa première extrémité que de sa seconde extrémité une seconde structure anti-rotation qui vient en prise avec la première structure anti-rotation (312), la première extrémité comprenant une partie élargie permettant d'obtenir un arrêt qui empêche l'élément de connexion d'un shaft (600) de s'étendre totalement dans la tête de club (102), et la seconde extrémité comprenant une structure de retenue, et la chambre cylindrique interne (608) s'étendant axialement vers la seconde extrémité, au-delà de la structure anti-rotation, un shaft (106) en prise dans la chambre cylindrique interne (608) de l'élément de connexion d'un shaft (600), une extrémité du shaft (106) s'étendant axialement vers la seconde extrémité de l'élément de connexion d'un shaft (600) au-delà de la seconde structure antirotation, et un élément de retenue (308) s'étendant dans la seconde extrémité de la chambre de réception d'un shaft (304) de la tête de club de golf (102) et mettant en prise de façon amovible la structure de retenue de l'élément de connexion d'un shaft (600) pour mettre ainsi en prise de façon amovible l'élément de connexion d'un shaft (600) avec la tête de club de golf (102), la structure de retenue de l'élément de connexion d'un shaft (600) comprenant un perçage fileté défini dans la seconde extrémité de la structure cylindrique et l'élément de retenue (600) comprenant un élément de boulon fileté (308) qui vient en prise avec le perçage fileté, et l'élément de boulon fileté (308) venant en prise de manière amovible la tête de club de golf (102) pour maintenir en place l'élément de connexion d'un shaft (600) par rapport à la tête de club de golf (102), et la structure cylindrique s'étendant dans une première direction axiale (626) et la chambre cylindrique interne (608) s'étendant dans une seconde direction axiale (630) différente de la première direction axiale (626), et le perçage fileté n'étant pas axialement aligné avec la seconde direction axiale (630).

7. Club de golf conforme à la revendication 6, dans

lequel :

au moins une partie de la première extrémité de la chambre de réception d'un shaft comporte une ouverture ayant une section transversale non circulaire pour permettre d'obtenir ainsi la première structure anti-rotation, et une partie de la surface externe en direction longitudinale de la structure cylindrique de l'élément de connexion d'un shaft a une section transversale non circulaire appariée et de forme correspondante pour permettre ainsi d'obtenir la seconde structure anti-rotation.

8. Club de golf conforme à la revendication 6, dans lequel au moins une partie de la première extrémité de la chambre de réception d'un shaft comporte une ouverture ayant une section transversale de forme polygonale pour permettre d'obtenir ainsi la première structure anti-rotation, et une partie de la surface externe, en direction longitudinale de la structure cylindrique de l'élément de connexion d'un shaft une section transversale de forme polygonale appariée et conformée de façon correspondante pour permettre ainsi d'obtenir la seconde structure anti-rotation.

9. Club de golf conforme à la revendication 6, dans lequel :

(1) une partie de la première extrémité de l'élément de connexion d'un shaft reste à l'extérieur de la chambre de réception d'un shaft de la tête de club de golf et la seconde structure anti-rotation s'étend dans la chambre de réception d'un shaft et vient en prise avec la première structure anti-rotation,  
 (2) la première ouverture de la chambre de réception d'un shaft est située sur la surface de semelle de la tête de club de golf, ou  
 (3) la chambre de réception d'un shaft comporte une surface interne au travers de laquelle est définie la première ouverture de la chambre de réception d'un shaft.

10. Club de golf conforme à la revendication 6, dans lequel la surface externe de la structure cylindrique, comporte au voisinage de la première extrémité de l'élément de connexion d'un shaft un premier indicateur de position de rotation, le premier indicateur de position de rotation étant situé sur la surface externe, entre la première extrémité de l'élément de connexion d'un shaft et la position dans laquelle commence la seconde structure anti-rotation, et la tête de club comprenant un second indicateur de position de rotation situé au voisinage de la chambre de réception d'un shaft.

11. Club de golf conforme à la revendication 6,

dans lequel le shaft comprend une région de modification de sa direction axiale.

12. Club de golf conforme à la revendication 6, dans lequel le shaft comprend au moins deux régions de modification de sa direction axiale. 5
13. Procédé d'obtention d'un ensemble de connexion d'un shaft et d'une tête de club de golf comprenant des étapes consistant à : 10

obtenir un élément de connexion d'un shaft (600) sous la forme d'une structure cylindrique ayant une première extrémité et une seconde extrémité opposée à la première extrémité, la première extrémité comprenant une partie élargie pour permettre d'obtenir un arrêt qui empêche que l'élément de connexion s'étende totalement dans le corps de la tête de club (102), obtenir une chambre cylindrique interne ouverte (608) permettant de recevoir un shaft de club de golf (106) à la première extrémité de l'élément de connexion d'un shaft (600), former une structure anti-rotation constituant une partie de la surface externe de la structure cylindrique plus près de la première extrémité que de la seconde extrémité, la chambre cylindrique interne (608) s'étendant axialement vers la seconde extrémité, au-delà de la structure anti-rotation, 20 25 30

former une structure de retenue à la seconde extrémité de l'élément de connexion d'un shaft (600), et

se procurer un élément de retenue (308) pour venir en prise avec la structure de fixation, la structure cylindrique s'étendant dans une première direction axiale (626) et la chambre interne cylindrique (608) s'étendant dans une seconde direction axiale (630) différente de la première direction axiale (626), et 35 40

la structure de fixation comprenant un perçage fileté qui n'est pas axialement aligné avec la seconde direction axiale (630).

14. Procédé d'assemblage d'un club de golf (100) comprenant des étapes consistant à : 45

se procurer une tête de club de golf (102) ayant une chambre de réception d'un shaft (304), une première extrémité de la chambre de réception d'un shaft comprenant une première structure antirotation (312) et une seconde extrémité de la chambre de réception d'un shaft comprenant une première ouverture permettant de recevoir un élément de retenue (308), 50 55

mettre en prise un shaft (106) avec un élément de connexion d'un shaft (600),

l'élément de connexion d'un shaft comprenant

une structure cylindrique ayant une première extrémité et une seconde extrémité opposée à la première extrémité, la première extrémité de l'élément de connexion d'un shaft comprenant une seconde ouverture qui définit une chambre cylindrique interne permettant de recevoir un shaft de club de golf (106),

la surface externe de la structure cylindrique comprenant plus près de sa première extrémité que de sa seconde extrémité une seconde structure anti-rotation venant en prise avec la première structure anti-rotation (312),

la première extrémité comprenant une partie élargie permettant d'obtenir un arrêt qui empêche que l'élément de connexion d'un shaft s'étende en totalité dans la tête de club, et la seconde extrémité de l'élément de connexion d'un shaft comprenant une structure de retenue, la chambre cylindrique interne s'étendant axialement vers la seconde extrémité de l'élément de connexion d'un shaft, au-delà de la seconde structure anti-rotation, et une extrémité du shaft s'étendant dans la chambre interne cylindrique et vers la seconde extrémité de l'élément de connexion d'un shaft jusqu'à une position située axialement au-delà de la seconde structure anti-rotation,

positionner au moins une partie de l'élément de connexion d'un shaft dans la chambre de réception d'un shaft de la tête de club de golf, de sorte que la première structure anti-rotation vienne en prise avec la seconde structure anti-rotation pour empêcher la rotation de l'élément de connexion d'un shaft par rapport à la tête de club de golf,

positionner un élément de retenue (308) dans la seconde extrémité de la chambre de réception d'un shaft, et

mettre en prise de façon amovible, l'élément de retenue avec la structure de retenue de l'élément de connexion d'un shaft, pour mettre ainsi en prise de manière amovible, l'élément de connexion d'un shaft avec la tête de club de golf, la structure cylindrique s'étendant dans une première direction axiale (626) et la chambre interne cylindrique s'étendant dans une seconde direction axiale (630) différente de la première direction axiale.

15. Procédé conforme à la revendication 14, comprenant en outre des étapes consistant à :

dégager l'élément de connexion d'un shaft de la tête de club de golf,

mettre en prise un second shaft avec un second élément de connexion d'un shaft, le second élément de connexion d'un shaft comprenant une structure cylindrique ayant une première extré-

mité et une seconde extrémité opposée à la première extrémité, la première extrémité du second élément de connexion d'un shaft comprenant une seconde ouverture qui définit une chambre cylindrique interne permettant de recevoir un shaft de club de golf, 5

la surface externe de la structure cylindrique du second élément de connexion d'un shaft, comprenant plus près de sa première extrémité que de sa seconde extrémité comprenant une troisième structure anti-rotation, et la seconde extrémité du second élément de connexion d'un shaft comprenant une seconde structure de retenue, 10

positionner au moins une partie du second élément de connexion d'un shaft dans la chambre de réception d'un shaft de la tête de club de golf de sorte que la première structure anti-rotation vienne en prise avec la troisième structure anti-rotation pour empêcher la rotation du second élément de connexion d'un shaft par rapport à la tête de club de golf, 15

positionner l'élément de retenue dans la seconde extrémité de la chambre de réception d'un shaft, et 20

mettre en prise, de manière amovible, l'élément de retenue avec la seconde structure de retenue du second élément de connexion d'un shaft pour mettre ainsi en prise de façon amovible, le second élément de connexion d'un shaft avec la tête de club de golf. 25 30

16. Procédé conforme à la revendication 14, comprenant en outre des étapes consistant :

(1) dégager l'élément de connexion d'un shaft de la tête de club de golf et mettre en prise de façon amovible un ensemble comprenant un second shaft avec la chambre de réception d'un shaft de la tête de club de golf, ou 35 40

(2) supprimer la mise en prise de l'élément de connexion d'un shaft avec la tête de club de golf, et modifier la position de l'élément de connexion d'un shaft par rapport à la tête de club de golf pour modifier ainsi la position d'une extrémité libre du shaft par rapport à la face de frappe de balle de la tête de club, ou 45

(3) mettre en prise, de manière amovible, l'élément de retenue avec la structure de retenue de l'élément de connexion d'un shaft pour mettre ainsi en prise de manière amovible l'élément de connexion d'un shaft par rapport à la tête de club de golf dans la position modifiée. 50

55

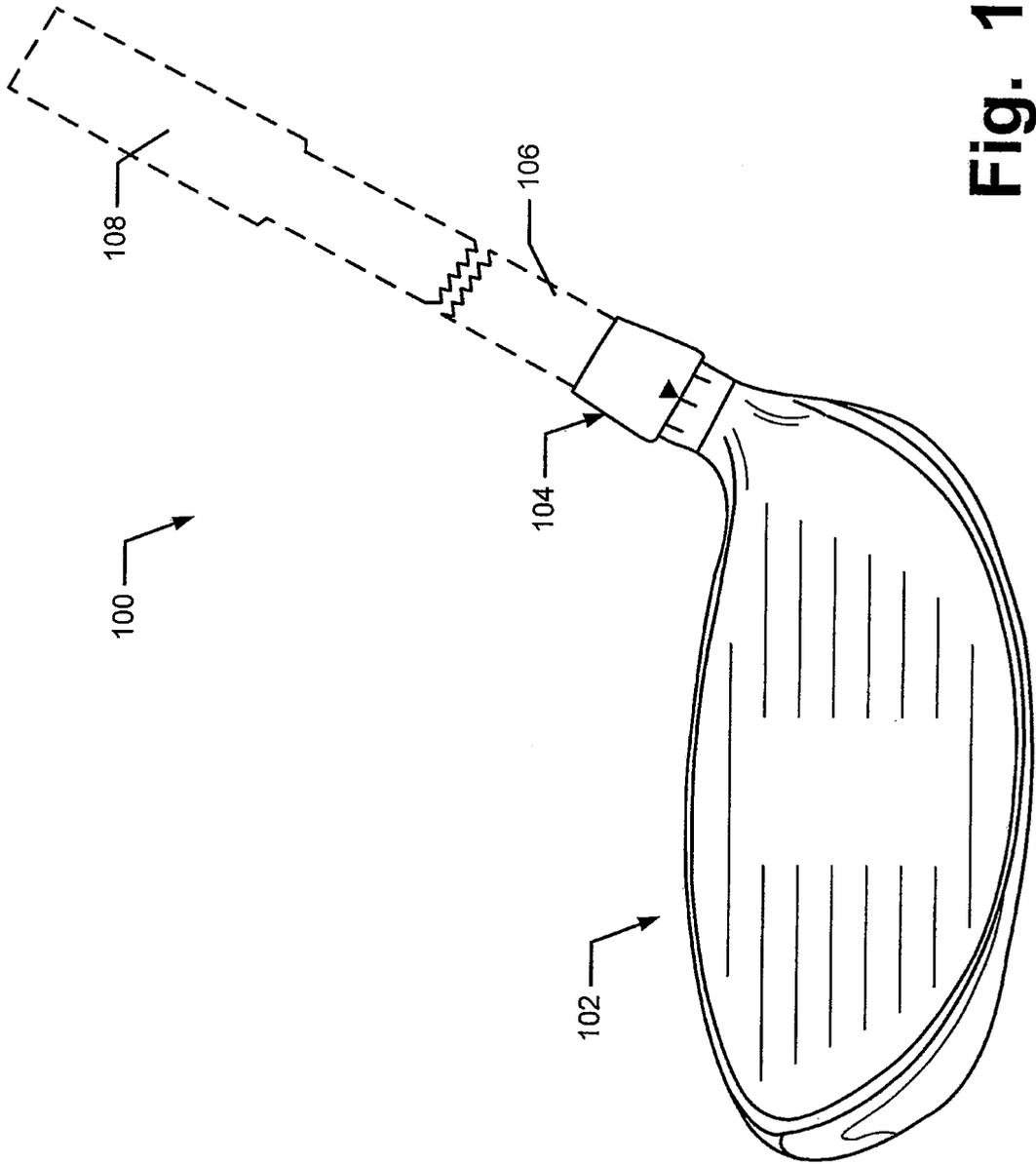


Fig. 1

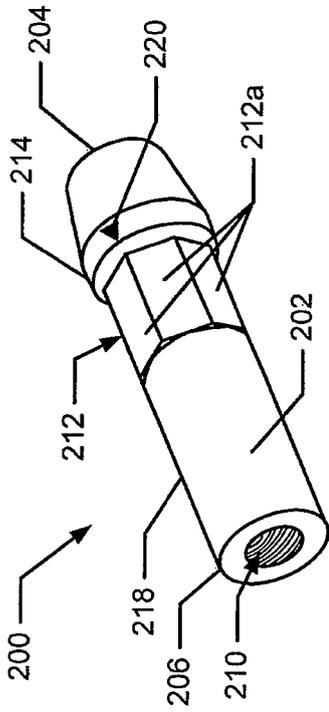


Fig. 2A

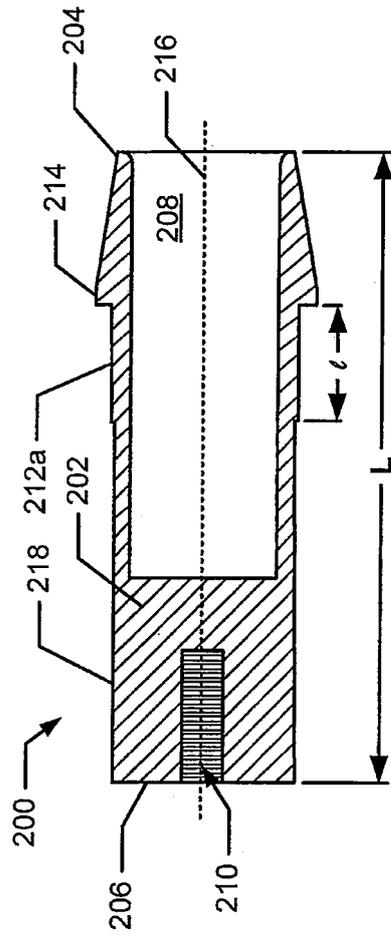


Fig. 2B

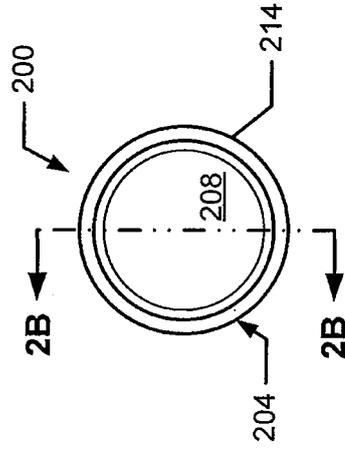
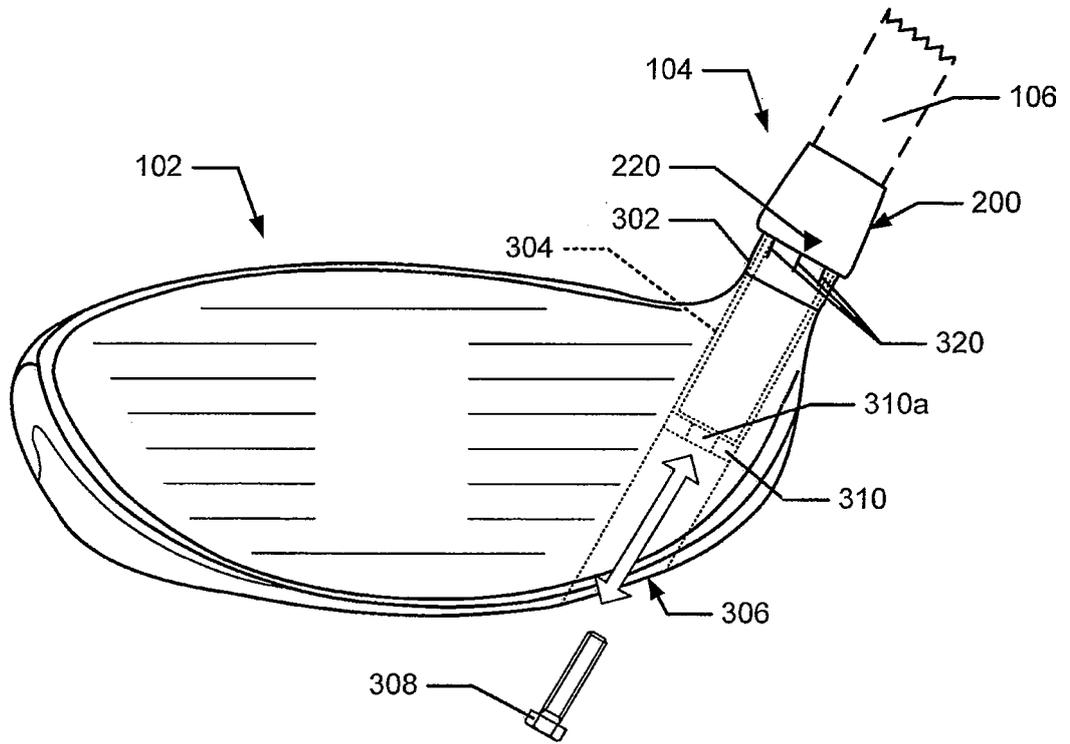
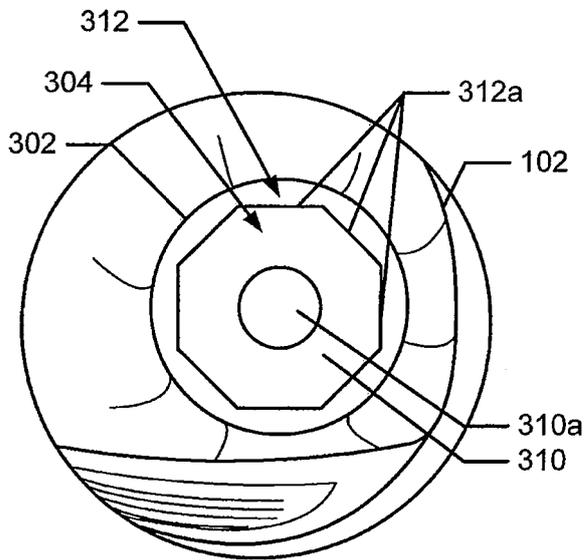


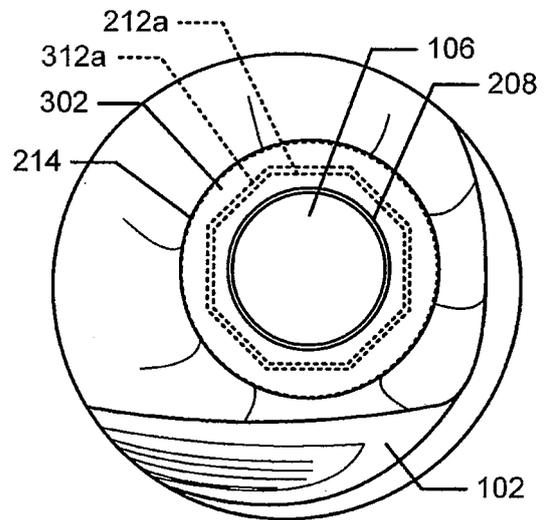
Fig. 2C



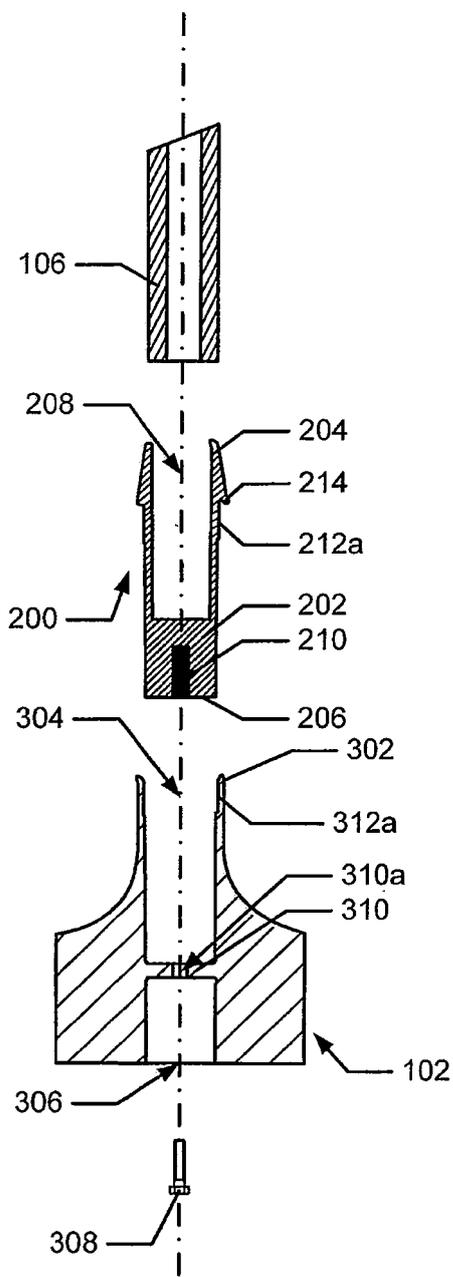
**Fig. 3A**



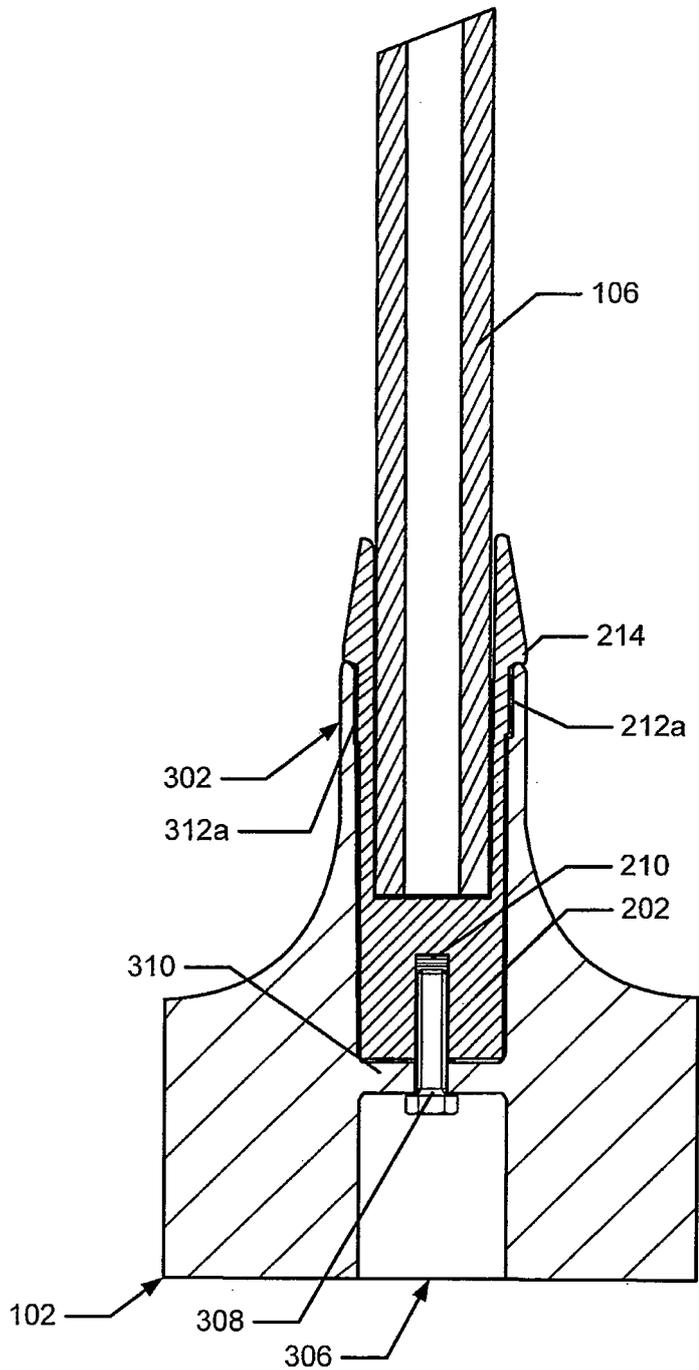
**Fig. 3B**



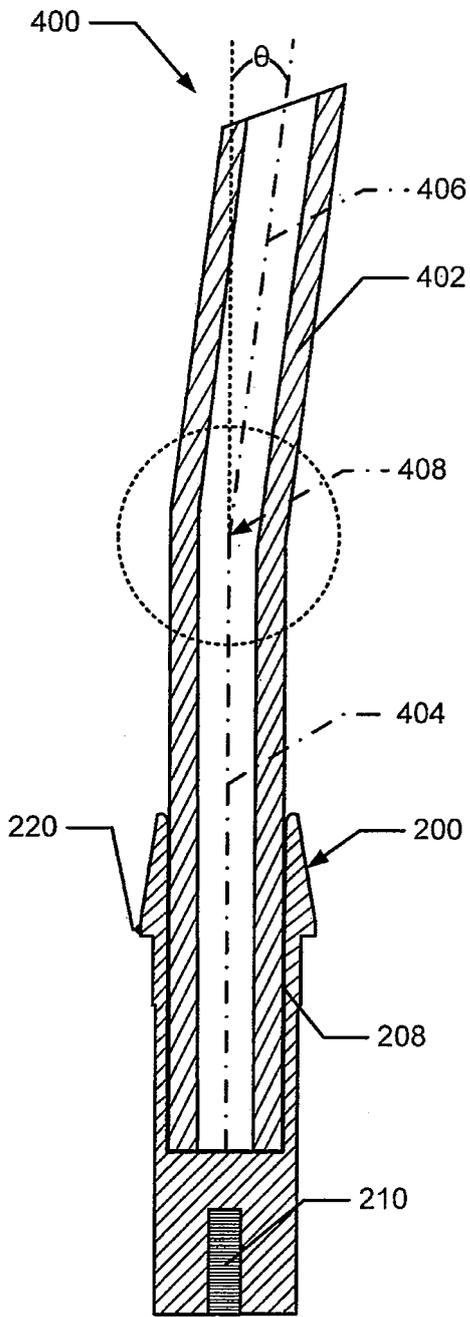
**Fig. 3C**



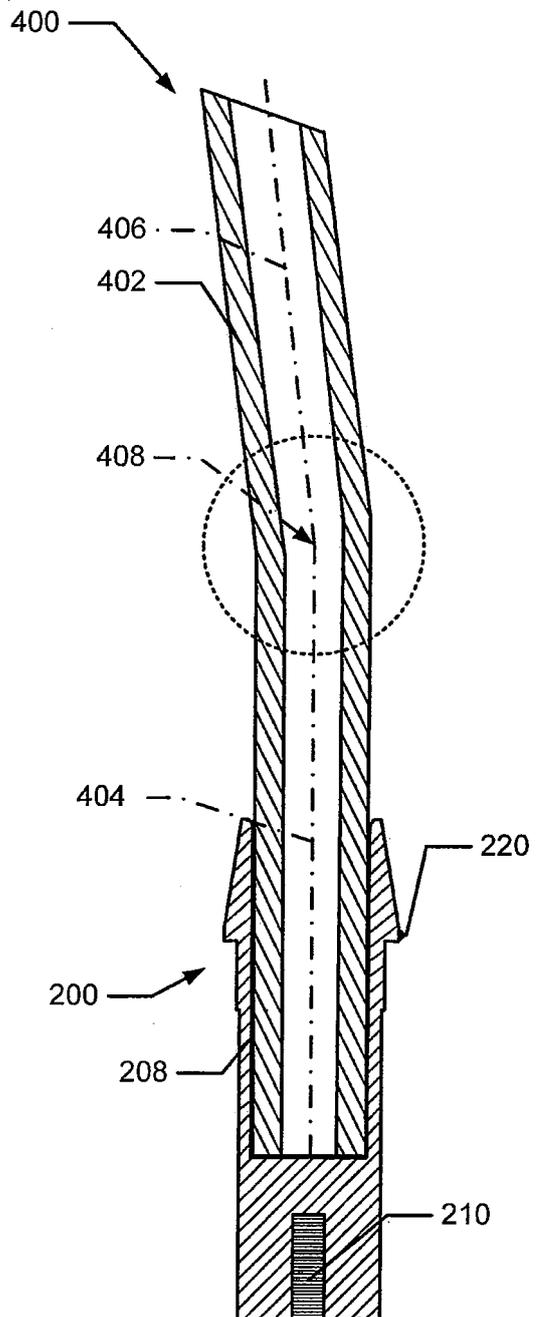
**Fig. 3D**



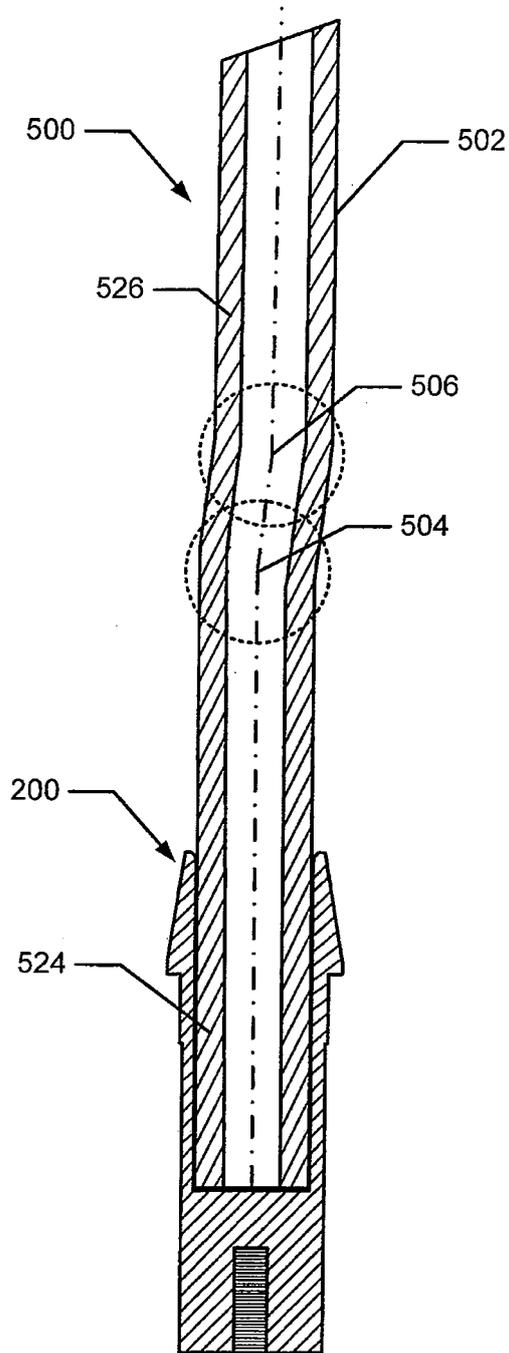
**Fig. 3E**



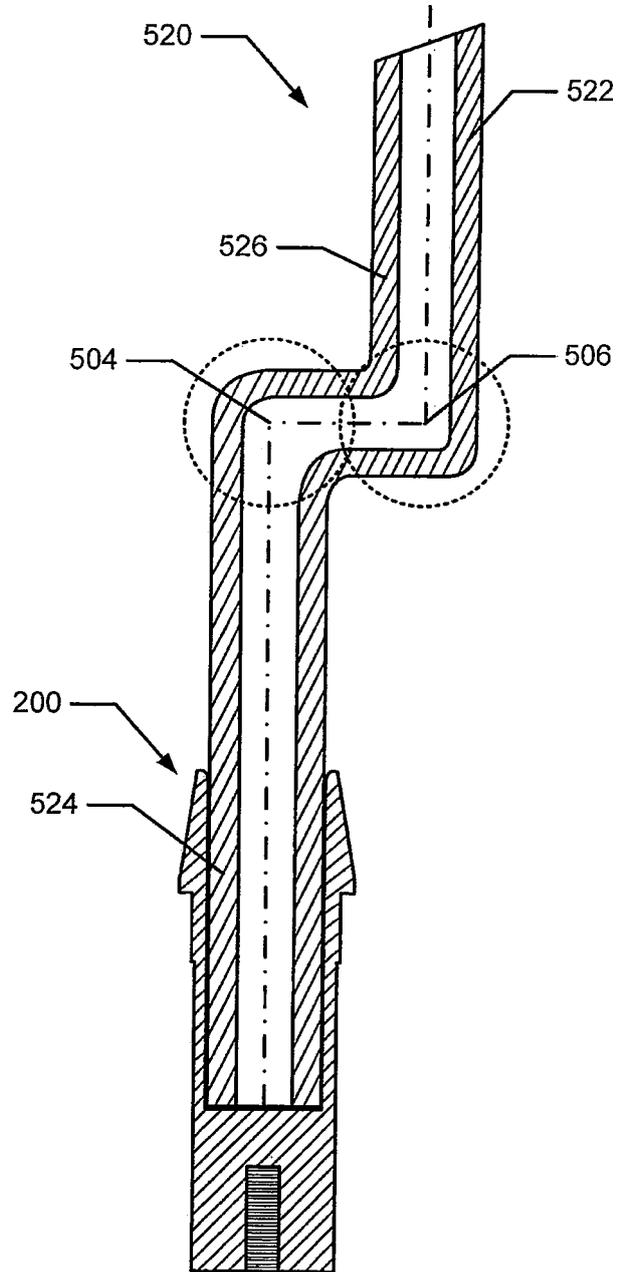
**Fig. 4A**



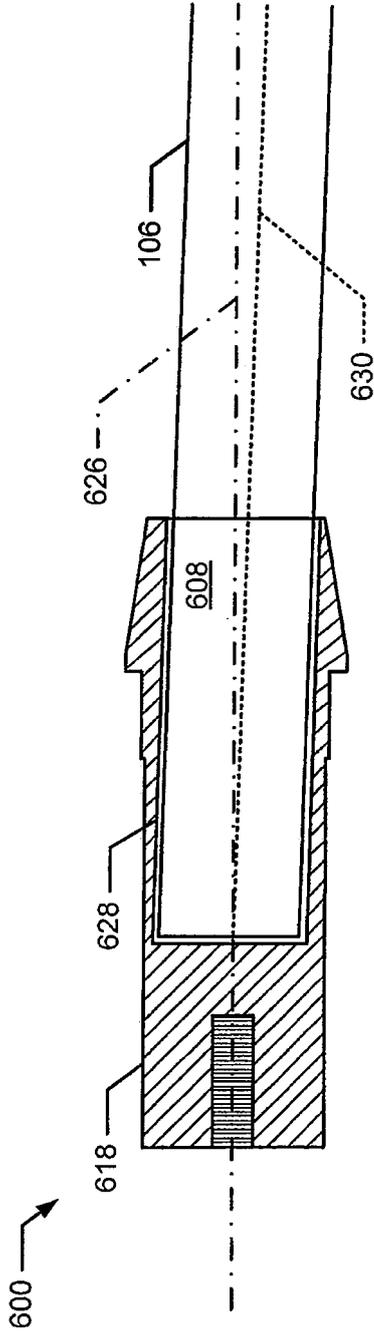
**Fig. 4B**



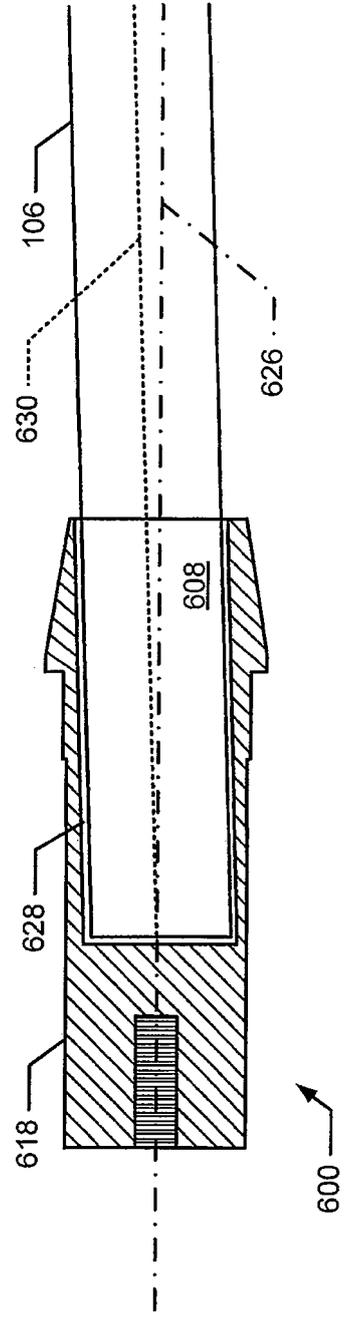
**Fig. 5A**



**Fig. 5B**



**Fig. 6A**



**Fig. 6B**

**REFERENCES CITED IN THE DESCRIPTION**

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**Patent documents cited in the description**

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